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ography on the Photochemistry of the Upper Atmosphere, p. 660

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY is a monthly publication devoted to:

- A. Current Abstracts in English on important meteorological literature in every language.
- B. Bibliographic references to other items of interest to the profession.
- C. Selective, annotated bibliographies on subjects of immediate and special interest to meteorologists.

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 6

MAY, 1955

No. 5



SPECIAL FEATURES IN THIS ISSUE

An Annotated Bibliography on the Photochemistry of the
Upper Atmosphere

by
Geza Thuronyi

(For complete table of contents see back cover)

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FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field and in related fields and to provide bibliographic information on various subjects, as interest demands.

Part I contains abstracts of current literature in the fields of meteorology, oceanography, etc., arranged according to the Universal Decimal Classification.

Part II of each issue comprises a special annotated bibliography of important references on a special subject. No attempt is made to prepare exhaustive bibliographies; instead, the aim is to include a representative cross section of the various aspects of a subject.

Bibliographies published in the successive issues were:

Vol. I, 1950

- | | | | |
|---------------------|-------------------------|--------------------|------------------|
| 1. Atmos. Pollution | 2. Aerobiology | 3. Cloud Physics | 4. Hail |
| 5. Tornadoes | 6. Volcanic Dust | 7. Climat. Changes | 8. Thunderstorms |
| 9. Icing | 10. Acoust. Propagation | 11. Evaporation | |

Vol. II, 1951

- | | | | |
|------------------------|--------------------------|-------------------|------------------------|
| 1. Extended Forecast. | 2. Long Range Forecast. | 3. Soil Temp. | 4. Constants, etc. |
| 5. Clim. of Near East | 6. Clim. of Middle East | 7. Special Winds | 8. Radar Storm Detect. |
| 9. Condensation Trails | 10. Clim. of N.E. Africa | 11. Mountain Met. | |

Vol. III, 1952

- | | | | |
|-------------------------|----------------------|-----------------------------|-----------------------|
| 1. Clim. of N.W. Africa | 2. Carbon Dioxide | 3. Clim. of Argentina, etc. | 4. Dew |
| 5. Objective Forecast. | 6. Stratus Forecast. | 7. Urban Climatology | 8. Clim. of C. Africa |
| 9. Visibility | 10. Glaze and Rime | 11. Free Air Turbulence | |

Vol. IV, 1953

- | | | | |
|----------------------|--------------------------|---------------|-----------------------------|
| 1. Turbulence Theory | 2. Turbulent Diffusion | 3. Frost | 4. Clim. of Australia, etc. |
| 5. High Level Winds | 6. Winds in Stratosphere | 7. Jet Stream | 8. Radiation Bioclim. |
| 9. Clim. of Pacific | 10. Auroras | 11. Sferics | |

Vol. V, 1954

- | | | | |
|--------------------|------------------------|--------------------------|--------------------|
| 1. Oceanog. Met. | 2. Clim. of S.E. Asia | 3. Auroral Physics | 4. Tropopause |
| 5. Balloons | 6. Numerical Forecast. | 7. Radiation Data | 8. Vertical Motion |
| 9. Clim. of Arctic | 10. Industrial Met. | 11. Wind Waves and Swell | |

Bibliographies published this year are:

- 1. Bibliography of Bibliographies on Meteorology, Vol. 6, No. 1, Jan. 1955
- 2. Textbooks and Monographs Containing Subject Bibliographies, Vol. 6, No. 2, Feb. 1955
- 3. Storm Surges, Vol. 6, No. 3, March 1955
- 4. Ionospheric Propagation, Vol. 6, No. 4, April 1955
- 5. Photochemistry of Upper Atmosphere, Vol. 6, No. 5, May 1955

Forthcoming bibliographies will be:

- 1. Cloud Physics, Vol. 6, No. 6, June 1955
- 2. Radar Cloud Physics, Vol. 6, No. 7, July 1955

Other bibliographies in preparation are:

- | | |
|--------------------------------------|---|
| <i>Actinometers</i> | <i>Night Airglow</i> |
| <i>Arctic Synoptic Meteorology</i> | <i>Ocean-Atmosphere Energy Exchange</i> |
| <i>Climate of the Arctic</i> | <i>Ozone</i> |
| <i>Cosmic Rays in the Atmosphere</i> | <i>Singularities</i> |
| <i>Fog Forecasting</i> | <i>Snow Cover</i> |
| <i>Indoor Climatology</i> | <i>Synoptic Aerology</i> |
| <i>Microwave Propagation</i> | <i>Tropical Cyclones</i> |

Part III contains a listing of the contents of those journals which are primarily meteorological. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. In the December issue cumulative author, subject, geographical and journal indexes are published.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DSG:	U. S. Army Medical Library, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory (and American Meteorological Society) Library, Milton, Mass.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts

Geographic locations are in the English form rather than the form used locally, for example Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146-151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, Jahrgang 2 (Vol. 2), Heft 5/6 (No. 5/6), pages 146-151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

TEXTBOOKS, MONOGRAPHS AND WORKS OF SPECIAL INTEREST

6.5-1 551.513.2:551.557
 †Riehl, H.; Alaka, M. A.; Jordan, C. L. and Renard, R. J., *The jet stream*. Foreword by F. A. Berry. *Meteorological Monographs*, (American Meteorological Society, Boston), (7), Aug. 1954. 100 p. numerous figs. (incl. photos.), 153 refs. Ch. 1-7 were given limited distribution as *U. S. Office of Naval Operations, NAVAER Report 50-1R-249*, June 1, 1953. **H-BH, DWB**—This monograph contains a detailed and systematic discussion (accompanied by synoptic charts, isotach charts, schematic diagrams, nomograms and cross sections) of the discovery of the jet stream, its synoptic aspects, climatology, reaction to extratropical cyclones, precipitation areas, hemispheric circulation patterns and extended forecasting; high level wind analysis, dynamics of jet stream formation and maintenance and, finally, an appended chapter on jet stream research from 1952-54 in the above subject areas. An excellent list of references is attached. Such refinements, as multiple jets, jet stream fingers, stoppage-jet stream relations, etc. are treated and indexed in a good subject-author index. See also 6B-201, Feb. 1955, *MAB*.) *Subject Headings: 1. Jet stream. I. Berry, F. A.—M.R.*

6.5-2 551.582.3(73)
 *Visher, Stephen Sargent (*Indiana Univ.*), *Climatic atlas of the United States*. Cambridge, Harvard Univ. Press, 1954. 403 p. 1031 charts. bibliog. p. 393-394. Review by Harry P. Bailey in *Science*, 121(3146):563, April 15, 1955. **DWB**—This is the first attempt at a climatic atlas for the United States in book form, and as such the obvious deficiencies must be overlooked, for no one could compile in so short a time over 1000 charts, almost half them original, and pay much attention to the niceties of cartography that even the U. S. Weather Bureau charts (which have been widely used in this edition) display. A wealth of data on all of the usual meteorological elements has been analyzed and presented in visual form and with the lines boldly drawn so as to give a simple "birds eye view" of the rough distribution or variation in the elements, with little regard for topography. In a few cases the actual data are presented on the chart (usually by states) or by graphs or histograms. Textual matter is ample for this type of atlas, and due credit is given for sources, but not much indication is given of the size of the sample which served as the basis for the rather arbitrary drawing of lines. It would be impossible to list the many types of data thus presented. The 31 charts (taken from a number of sources) are arranged under 34 chapters in the major sections: 1) temperature, 2) wind, 3) sunshine, 4) humidity, 5) precipitation, 6) effects of climate on weather and 7) climatic regions and changes. Effects on agriculture, health, soils, lakes, streams and topography are covered in section 6. Unusual features are charts of degree days, variability or expectancies of extremes, droughts, excessive rainfall, week to week and month to month temperature changes; duration (in days per year) of warm weather (0° to 68°F), etc. The fact that isopleths are frequently jerky and even run into one another, or disappear does not detract from the overall picture one gets of the non-homogeneity of climatic elements, along any given parallel of latitude. The annotations with each chart will help. *Subject Headings: 1. Climatic atlases 2. Climate of the United States 3. United States.—M.R.*

6.5-3 551.582(99)
 *†Pepper, J. (*Met. Office, London*), *Meteorology of the Falkland Islands and Dependencies, 1944-1950*. London, Pub. for the Falkland Islands Dependencies Survey, 1954. 249 p. numerous tables, photos., diagrs., map (fold., tipped in cover), 87 refs. At head of t-p:

Falkland Islands and Dependencies Meteorological Service. Price: L2.2s.0d. Crow Agents, 4 Millbank, London. **DWB**—This very thorough and well prepared volume, presenting a summary of the first seven years of meteorological observations, consists of three parts. Pt. 1.—Discussion—is a detailed analysis of the several meteorological variables including data on frequencies of temperature, pressure, wind, clouds, humidity, precipitation, monthly and annual means, visibility, moisture data, etc. Pt. 2.—Gazetteer—gives the history of the general surroundings and site of the bases in the Falkland Islands and Dependencies includes topographical details of the station, maps of the stations and a brief history of each station. Pt. 3.—Tables—contains extensive monthly and annual summaries of meteorological observations made during the period 1946–1950. The appendices contain a discussion of the Antarctic Convergence, an account of the distribution of pack ice in the Southern Ocean and ice reports from bases for 1950, etc. There are also bibliographic references, and excellent graphs, photographs and maps. *Subject Headings*: 1. Climatology monographs 2. Climate Falkland Islands 3. Falkland Islands. I. Falkland Islands. Meteorological Service. I.L.D.

6.5-4

551.582(494) 551.5:551.4

*†Götz, Frederick Wilhelm Paul (*Arosa, Switzerland*), *Klima und Wetter in Arosa nach fünfundfünfzigjährigen Aufzeichnungen seiner Meteorologischen Station*. [Climate and weather in Arosa according to 55 years of records at the Meteorological Station.] Frauenfeld, Huber, 1954. 148 p. 65 figs. (incl. photos.), 64 tables, 127 refs. **DLC**—This is a beautiful printed and edited local climatology and the quality of the contents fully justifies the quality of the edition. The site of the station, temperature conditions, humidity (lack of), purity of the atmosphere, wind and föhn, cloudiness, rain and snow, sunshine, radiation climatic and climatic seasons and variations occupy separate chapters with complete and detailed coverage of each subject, analytical tabular data, beautiful illustrations, charts and graphs and a scholarly analysis of the data in each chapter. The chapters on radiation and sunshine are especially good, though the author's extensive research on dust, ozone, snow and föhn winds is evident in the corresponding chapters and excellent bibliography. *Subject Headings*: 1. Climate of Arosa, Switzerland 2. Mountain meteorology 3. Global radiation data 4. Arosa, Switzerland.—M.R.

6.5-5

551.5:629.13(0)

Murchie, Guy, *Song of the sky*. With illus. by the author. Boston, Houghton Mifflin, 1954. 438 p. **DWB, DFC**—An extremely readable text, by a reporter who is also a flyer and an expert in air navigation, based on experiences during and after the second World War in teaching navigation and in actual trans-oceanic air navigation. The book takes up in an interesting but scholarly way the history of navigation, principle and equipment and methods of navigation, and a great deal about meteorology or weather as it affects flying. Wind, clouds, thunder, hail, rain, ice, snow, Arctic flying, magnetic storms, hurricanes, cloud physics, rain, rainbows, acoustical phenomena, pressure phenomena, fronts, radar and radio, the sonic barrier, balloons, mountain waves, etc. Although written in a journalist style, the book is logically arranged and is elaborately indexed. *Subject Headings*: 1. Aeronautical meteorology 2. Air navigation 3. Textbooks.—M.R.

6.5-6

551.46(02) 551.4

Istoshin, I. V., *Okeanografiia*. [Oceanography.] Leningrad, Gidrometizdat, 1955. 45 p. 120 figs. (some fold.), 70 tables, 15 refs. **DLC**—A modern text in elementary physical oceanography for students of practical hydrometeorology, marine meteorology and for those wishing general information on the oceans and seas. The book is divided into 3 sections: 1) general oceanography, 2) hydrological characteristics of the several oceans and seas (Atlantic, Pacific, Indian, Arctic; bordering seas and major inland seas, and lakes) and 3) methods of observation, instruments and compilation of marine and oceanographic data. Although concerned mainly with marine geology, submarine physics and chemistry, tides and other non-meteorological factors, much material on wind-waves, currents, ice, continental-ocean effects, temperature, heat and moisture balance is included. *Subject Headings*: 1. Physical oceanography 2. Hydrography 3. Oceanography textbooks.—M.R.

6.5-7

532.5(02) 551.551

†Kochin, Nikolai Evgrafovich; Kibel', I. A. and Roze, N. V., *Teoreticheskaya gidromekhanika*. [Theoretical hydromechanics.] Leningrad, Gosud. Izdat. Tekhniko-teoreticheskoi Literatury, 1948. Revised 4th ed. 2 v. (vol. 1, 535 p. 179 figs., refs. p. 527-30, numerous eqs.; vol. 2, 612 p. 156 figs., refs. p. 605-607, numerous eqs.). Review of German translation of Vol. I by Sutton, O. G., in *Meteorological Magazine*, 84(991):27, Jan. 1955. **DLC**—The several parts of this voluminous and highly theoretical treatise (or collection of treatises) cover in the first volume: I. Kinematics of fluids (A. Deformation field, B. Equations of continuity, C. Kinematics of rectilinear and vortex motion); II. Basic equations of hydrodynamics of ideal fluids; III. Hydrostatics; IV. Simple cases of motion in ideal fluids; V. Eddy motion in ideal fluids (KOCHIN); VI. Simple problems of movement of bodies in ideal fluids; VII. Extension of problems of motion in an ideal fluid; VIII. Wave motion in an ideal fluid (KOCHIN) including basic equations, simple waves, 3-dimensional waves and long waves. In the second volume: I. Theoretical basis of gas dynamics (KIBEL'); II. Movement of viscous fluids (KOCHIN); III. Elementary theory of turbulence (KIBEL'). *Subject Headings*: 1. Theoretical hydrodynamics 2. Turbulence theory 3. Eddy motion 4. Textbooks.—*M.R.*

6.5-8

551.510.536 523.59

†Hope, E. R. (trans.), *The earth's exterior atmosphere and the counter glow*. The counter glow as related to modern geophysical theories. With seven recent Russian papers collected and translated by E. R. Hope. 2nd ed. Ottawa, Defence Research Board, Defence Scientific Information Service, July 1954. xxvii+51 p. illus., refs. *Canada. Defence Research Board*, T. 65 R, July 1954. Contents: Hope, Earl R., *The counter glow as related to modern geophysical theories*. Astapovich, I. S., *Problem of the counter glow*. Fesenkov, V. G., *Report of address*. Fesenkov, V. G., *On the gaseous tail of the earth*. Divari, N. G., *Photometric observations of the counter glow*. Fesenkov, V. G., *Gaseous tail of the earth* [different article]. Karimov, M. G., *The nature of the counter glow*. Divari, N. B., *The pressure of solar radiation on the atoms of certain gases*. **DWB**. First edition, July 1952, under title: *Earth's exterior atmosphere and the counter glow*: recent Russian papers collected and translated. Contained first five of above cited Russian papers. 39 p. **DLC**—The first edition (1952) contained the complete translations of the 1st 5 papers cited above; accompanied by an 8 page translator's commentary (with schematic diagrams) discussing and summarizing the theory and observational evidence as presented in these papers. FESENKOV, the long time czar of Soviet astrophysics, at first refused to admit the possibility of a gaseous "tail" to the earth's atmosphere, but later (1950) recognized the phenomenon which was discovered by ASTAPOVICH before 1944 (and reported in *Priroda* early in 1950) on the basis of observations of the counter glow made under the extremely good observing conditions of Turkmenistan in Central Asia in 1942-44, and confirmed by photometric observations made in 1946-49 by several observers. The astronomical, geometrical and spectrophotometric as well as theoretical evidence is discussed thoroughly in these articles and is amply illustrated. The second (1954) edition contains translations of the two added papers (KARIMOV and DIVARI) on the nature of the Counter glow and the Pressure of Solar Radiation on Atomic Gases, respectively. The discussion is amplified to 26 pages, involving a discussion of the root of the tail, the divergence of the tail, the Bennett-Hulburt theory and the Radzievski (1953) theory. Corrections in translations, critical notes on the various theories, and a good bibliography (26 refs.) are included in the foreword (the originals of several of these articles are abstracted separately). *Subject Headings*: 1. Gaseous tail of earth's atmosphere 2. Exosphere 3. Counter glow.—*M.R.*

6.5-9

551.507.362:551.510

*†Boyd, R. L. F.; Seaton, M. J. (both Univ. College, London) and Massey, Harrie, S.W., (eds.), *Rocket exploration of the upper atmosphere*. Special supplement (vol. 1) to the *Journal of Atmospheric and Terrestrial Physics*. London, Pergamon, 1954. 376 p. numerous figs. (incl. photos), tables, refs., and eqs. On t-p: Papers included in this volume were read at a conference arranged by the Upper Atmosphere Rocket Research Panel of the United States and by the Gassiot Committee of the Royal Society of London. **DWB**—About 50 articles on various aspects of rockets, rocket research and knowledge of high atmosphere physics gained

from rocket flights, presented at the Oxford Conference on Aug. 24-26, 1953, are published in this nicely bound book. The papers are grouped under: I. Rocket techniques; II. Pressure, temperatures and winds; III. Composition of high atmosphere; IV. Ionosphere, solar radiation, geomagnetic variations; V. Rocket cosmic ray measurements; VI. Laboratory studies and VII. Theory and future research. Each article will be abstracted separately and published in this or subsequent issues. Contents are listed on p. 707-709, Pt. III. *Subject Headings*: 1. Rocket research 2. Upper atmosphere physics 3. Upper air data. I. Royal Society of London. Gassiot Committee II. Upper Atmosphere Rocket Research Panel (U. S.).—M.R.

6.5-10

551.593.54:551.508.93(01)

†Volz, Friedrich, *Die Optik und Meteorologie der atmosphärischen Trübung*. [The optics and meteorology of atmospheric turbidity.] *Germany. Deutscher Wetterdienst. Berichte*, 2(13), 1954. 47 p. 31 figs., 10 tables, 86 refs. DWB—A first-class monograph treatment of (Pt. I) the theory, instrumentations, measurement, techniques used at various places. Pt. II deals with results of measurements under 3 turbidity types in high mountain areas and in plains (Arosa—since 1950 and Frankfurt a.M.—since 1952, respectively), and the ground layers (searchlight measurements). Pt. III develops the theory in more detail the light of results of measurements. The subjects of scattering, extinction, sky illumination, Bishop's rings, aerosol nature and size, effect of angle of incidence and reflection or refraction of light, etc. are covered in detail. Measurements were made with a spectrograph (0.3 to 0.8 μ) at Arosa (1860 m) and with a selenium photometer (0.43 to 0.63 μ) at Frankfurt and Mainz. Results obtained during the "Blue sun" in Sept. 1950 are given in detail and discussed. Also the effect of water and of ice clouds is considered. The height and particle size of haze layers are calculated and consideration given to stratus clouds, cold air invasions and abnormal conditions in the ground layer (very fine particles or haze rings near the sun). Conditions in the lower stratosphere are calculated from GRÜNER's twilight observations. Results of other authors are given in graphical form and discussed. The theory of complex distribution functions and of power distribution of aerosols are worked out on the basis of sky brightness measurements. An extensive and useful bibliography is appended. *Subject Headings*: 1. Atmospheric optics 2. Turbidity measurements 3. Blue sun—Sept. 1950 4. Bibliographies 5. Arosa, Switzerland 6. Frankfurt a.M., Germany.—M.R.

6.5-11

551.508.91:551.510.4

Institute of Physics, London, *The physics of particle size analysis*. A conference . . . held in the University of Nottingham from the 6 to 9 April, 1954. *British Journal of Applied Physics, Supplement*, No. 3, London, 1954. 6+S218 p. figs., tables, eqs. DLC—The report includes text of 33 papers in 8 groups: A, Relative motion of particles and fluids: size separation. B, Relative motion of particles and fluids: molecular phenomena. C, Scattering and absorption of light by particles. D, Particle shape factors. E, Visual counting and sizing of microscopic particles: theory. F, Automatized counting and sizing: photoelectron machines. G, General. Each session is followed by a discussion, and the results of the conference are summed up by H. HEYWOOD. Among the papers of special interest to meteorologists are: Timbrell, V., *The terminal velocity and structure of airborne aggregates of microscopic spheres*, p. S12-16; Davies, C. N., *Survey of scattering and absorption of light by particles*, p. S64-65; Ellison, J. McK., *Light scattering by polydisperse dust clouds*, p. S66-71; Lewis, P. C. and Lothian, G. F., *Photoextinction measurements on spherical particles*, p. S71-74; Timbrell, V., *The terminal velocity and size of airborne dust particles*, p. S86-90; Hamilton, R. J., *The relation between free-falling speed and particle size of airborne dust*, p. S90-93; DallaValle, J. M.; Orr, Clyde, Jr. and Hinkle, B. L., *The aggregation of aerosols*, p. S198-206. *Subject Headings*: 1. Aerosol measurement. I. Heywood, H.—C.E.P.B.

6.5-12

551.508:551.51

Johns Hopkins Univ. Laboratory of Climatology, *Micrometeorology of the surface layer of the atmosphere*. The flux of momentum, heat, and water vapor. Contract A-19(604)-289, Final Report, 1954. (p. 233-361) tables, figs., refs. Also issued as its *Publications in Climatology*, 7(2):233-361, 1954. MH-BH—A summary of accomplishments during

years of micrometeorological research, initiated by THORNTHWAIT, with primary emphasis the precipitation, during the Air Force Great Plains Turbulence Expedition (at O'Neill) in the summer of 1953. In the 16 page "Introduction," THORNTHWAIT describes mainly the development of micrometeorological instruments and the choice of observational sites. Thirteen other papers follow, dealing with the measurement of air temperature, humidity and wind velocity profiles, of surface drag, radiation, heat transfer, soil moisture tension and evapotranspiration. The mobile micrometeorological station used at O'Neill is described in detail. A substantial account of the theory of turbulent transfer with some evaluations of the O'Neill data by HALSTEAD concludes the report. *Subject Headings:* 1. Micrometeorological instruments 2. Turbulent transfer 3. Great Plains Turbulence Expedition, 1953 4. Seabrook, J. 5. O'Neill, Nebraska. I. Thornthwaite, C. W.—A.A.

GENERAL METEOROLOGY

See also: Climate and weather in Arosa (Götz), 6.5-4; Song of sky (Murchie), 6.5-5; Meteorological engineering (Hewson), 6.5-193.

6.5-13 551.5(058)

†Australia. Commonwealth Scientific and Industrial Research Organization, **Fifth Annual report for the year ending June 30, 1953.** Canberra, 1953. 191 p. Meteorology, p. 131-141. DWB—Progress made during the year on a number of projects in the fields of radio physics and atmospheric physics and astrophysics is described in Ch. 27, 28, 29, on pages 139-147. Special research on the ionosphere, twinkling of radio stars, general circulation, convection, micrometeorology, frost prevention, ozone, evaporation, artificial precipitation, cloud physics, nuclei, high level winds, climatic changes (rainfall), solar physics, radio astronomy, etc. is reported and discussed. Nearly 50 papers published by members of the several divisions related to meteorology are cited. Costs and contributions for the year are tabulated. *Subject Headings:* 1. Meteorological research 2. Annual service reports 3. Australia.—M.R.

6.5-14 551.5:06(058)

Great Britain. Meteorological Office, **Annual report of the Director . . .** presented by the Meteorological Committee to the Secretary of State for Air for the year April 1, 1953 to March 31, 1954. London, 1954. 61 p. At head of title M.O. 586. GB-MO—This report follows the pattern of previous years, describing the organizations for forecasting, climatology, marine and agricultural meteorology, and research including instrument development. O. G. TATTON became Director on Sept. 1, 1953, succeeding SIR NELSON JOHNSON. *Subject Headings:* 1. Annual service reports 2. Great Britain.—C.E.P.B.

6.5-15 551.5(09)

Hay, R. F. M., **Some landmarks in meteorological progress 1855-1955.** Pt. 1. *Marine meteorology*, 25(167):11-16, Jan. 1955. MH-BH—The organization set up in 1855 for making and charting meteorological observations at sea is described. Forecasting by synoptic charts dates from 1859, but early studies of cyclones and anticyclones led to over-optimism. SHAW and LEMPFEY's "Life history of surface air currents" in 1906 was followed 12 years later by ERKENS' "Polar front theory." Progress is followed through extending use of upper air data in forecasting, study of circulation patterns, introduction of computing machines, and weather ships. *Subject Heading:* 1. History of meteorology.—C.E.P.B.

6.5-16 551.5(26)(09)

Parkhurst, P. G., **Ocean meteorology. A century of scientific progress.** Pt. 1. *Marine meteorology*, 25(167):16-21, Jan. 1955. plate. MH-BH—This article, based on old records of the Board of Trade, sets out the history of the systematic collection and discussion of meteorological observations at sea from the introduction of MARSDEN's "squares" in 1831. The first International Meteorological Conference at Brussels in 1853, the resulting formation of the Meteorological Department of the Board of Trade, and the first issues of weather forecasts, are described. *Subject Heading:* 1. History of marine meteorology.—C.E.P.B.

6.5-17

551.5:016(98,99):91.0

†*Expéditions Polaires Françaises, Liste des publications des Expéditions Arctiques et Antarctiques (Groenland et Terre Adélie)*. [List of publications of Arctic and Antarctic expeditions to Greenland and Adélie Land.] Paris, Dec. 1952. 35 p. Mimeo. **MH-BH**—About 50 references are given to studies or reports of meteorological interest which result from the Greenland and Antarctic expeditions under PAUL-ÉMILE VICTOR. They are on the subjects of snow, micrometeorology, upper air soundings, ionosphere, atmospheric physics, atmospheric electricity and atmospheric optics, and general meteorological observations. Other references concern geography, geodesy, oceanography, etc. *Subject Headings*: 1. French Polar Expedition 2. Bibliographies on Antarctic 3. Bibliographies on Greenland 4. Greenland 5. Antarctic.—*M.R.*

6.5-18

551.5:016:0

†World Meteorological Organization. Commission for Bibliography and Publications. First Session, Paris 1953, [**Reports**]. Its *CBP-I/ Documents*, No. 20-27, Oct.-Nov. 1953. Mimeo. each report repaged. Contents: Doc. 20, Vandenas, A., **Meteorological activities in Belgium in the field of Bibliography and Publications**; Doc. 21, Roy, S. C., . . . in India . . . ; Doc. 22, Bouman, D. J., . . . in the Netherlands . . . ; Doc. 23, Schumann, T., . . . in the Union of South Africa . . . ; Doc. 24, *Publicaciones del Servicio Meteorológico Nacional* (Argentina); Doc. 25, Great Britain. Meteorological Office, **Report on progress in publications, bibliography and exchange arrangements since 1947**; Doc. 26, Bouman, D. J., **Remarks and proposals concerning section 551.5 of the U.D.C.**; Doc. 27, ICAO-WMO coordination in the field of terminology by the Secretary General of ICAO. **DWB**—Papers presented by a few of the delegates to the Paris meeting of CB-P in Nov. 1953. Not all reports were included. The report from India lists several hundred publications or papers by Indian meteorologists. *Subject Headings*: 1. Publications 2. Bibliographies 3. U.D.C. 4. WMO. Commission for Bibliography and Publications 5. WMO. meetings.—*M.R.*

6.5-19

551.5:016:0

World Meteorological Organization. Commission for Bibliography and Publications. First Session, Paris, Nov. 24-Dec. 12, 1953, **Abridged final report**. Its *WMO*, No. 31. RP. 15. 1954. 53 p. Price: Sw. Fr 3.— **DWB**—Since only 10 members of WMO were represented at the Paris meeting, a quorum was not obtained and all voting had to be by mail, subsequent to the meeting. Those present, the agenda, resolutions and recommendations are given in this report, as well as suggested changes in U.D.C. 551.5 subdivisions, and a summary of the work of the session. A working group on Terminology was formed and Technical Regulation were presented in first draft. A manual of librarianship was also drafted, and recommendation made that WMO publish a cooperative World Meteorological Bibliography, classified under U.D.C., but without any author index. M. MÉZIN was reelected president and G. A. BULL vice president. *Subject Headings*: 1. WMO. Commission for Bibliography and Publications 2. U.D.C. for meteorology 3. Paris, France. I. Mézin, Maurice II. Bull, G. A.—*M.R.*

6.5-20

551.5:06(26)(09)

Fitzroy, Robert, **Extracts from Admiral Fitzroy's first report on the Office. Marine Observer**, 25(167):5-10, Jan. 1955. Also: [Frankcom, C. E. N.], **Editorial. Ibid.**, p. 2-5. 2 figs., 4 plates (incl. ports.) **MH-BH**—The Centenary Number of the *Marine Observer* opens with a message from the Director, followed by an Editorial summarizing the history of the British Meteorological Office, especially the Marine Branch, since 1855. Extracts from the first Report of the Meteorological Department of the Board of Trade, dated May 23, 1855 set out the plans of the new Department for marine meteorological observing and charting. A note on Early Synoptic Charts p. 9, describes and reproduces two charts for Oct. 26, 1859 showing the storm in which the "Royal Charter" was lost. Portraits of Vice-Admiral ROBERT FITZROY and Dr. O. G. SUTTON are included. *Subject Headings*: 1. History of meteorology 2. British Meteorological Office.—*C.E.P.B.*

6.5-21

551.5:06(058)

Malaya. Meteorological Service, **Annual report, 1953**. Singapore, 1954. 4 p. **DWB**—In the annual Report for 1951, the organization and functions of the Malayan Meteorological

service were described. In this report the changes made during 1953 are described, particularly in the aviation forecast, shipping activities, stations and staff. *Subject Headings:* 1. Meteorological services 2. Annual service reports 3. Malaya. I. John, I. G.—*M.R.*

6.5-22

551.5:06

Sutton, O. G., *World Meteorological Organization. Fifth session of the Executive Committee. Meteorological Magazine*, London, 83(989):322-325, Nov. 1954. Also article with similar title in *World Meteorological Organization, WMO Bulletin*, 3(4):120-123, Oct. 1954. DWB—Work of the Session from Aug. 25-Sept. 11, 1954, is summarized. Points noted include joint report of Commission for Aeronautical Meteorology and Meteorology Division of ICAO, questions of International Meteorological Bibliography and World Climatological Atlas, and a discussion on atomic explosions and weather. *Subject Headings:* 1. World Meteorological Organization 2. WMO. Executive Committee Meetings.—*C.E.P.B.*

6.5-23

551.5:06

Van Mieghem, Jacques, *International co-ordination of meteorological research. World Meteorological Organization, WMO Bulletin*, 11(4):96-101, Oct. 1953. DWB—Extracts from presidential address at the first session of the WMO Commission for Aerology, Toronto, Aug. 1953. The main ideas expressed are the need: 1) for effective international organization, 2) for an International Meteorological Institute, 3) for international meteorological abstracts and progress reviews (*Compendium of Meteorology* and *MAB* are mentioned). All of these needs could be met by an effective International Meteorological Bureau such as was proposed 30 years ago by BUYS BALLOT at Vienna, and many times since by others. *Subject Headings:* 1. International Meteorological Bureau 2. Meteorology abstracts.—*M.R.*

6.5-24

551.5:629.13:37(02)

Kadmon, Naftali, *Meteorologiyah*. [Meteorology.] [National Training Center, Israel Aviation Club, 1953?] 26 p. illus., eqs. Mimeo. In Hebrew. DWB—A simple manual or text on synoptic and dynamic meteorology to be used as an elementary course for glider pilots, etc. Schematic diagrams and synoptic chart are included. *Subject Headings:* 1. Elementary meteorology textbooks 2. Pilots training courses 3. Hebrew language 4. Textbooks.—*M.R.*

6.5-25

551.5:629.13:06

Namias, J., *Presentation of AMS award for distinguished service to meteorology to Harry F. Guggenheim, April 30, 1953. Also: Guggenheim, Harry F., Address before the American Meteorological Society Meeting in Washington, D. C. April 30, 1953. American Meteorological Society, Bulletin*, 34(6):273-276, June 1953. MH-BH—In address presenting award to HARRY GUGGENHEIM, NAMIAS mentions his contributions to aviation and meteorology, namely: 1) establishment of first commercial airline, 2) establishment of first intensive airways observing and teletype reporting network in California (ROSSBY and BYERS, 1926), 3) establishment of advanced course in meteorology at MIT (1928) and 4) help in reorganization of A.M.S. in 1946. Mr. GUGGENHEIM in his lecture paints a glowing picture of the future role that meteorology will play in national and international economy. *Subject Headings:* 1. Aviation meteorology 2. American Meteorological Society 3. Awards.—*M.R.*

6.5-26

551.5:63(411)

Royal Meteorological Society, *Symposium on meteorology and Scottish agriculture. Grainger, John, Climate, host and parasite in crop disease (see 6.5-306); Grainger, John; Sneddon, J. L.; Chisholm, E. de C. and Hastie, A., Climate and the yield of cereal crops. Fig., table; Waterhouse, F. L., Microclimatological profiles in grass cover in relation to biological problems (see 6.5-291); Coutts, J. R. H., Soil temperatures in an afforested area in Aberdeenshire (see 6.5-166); Caborn, J. M., The influence of shelter-belts on microclimate. 15 refs. (see 6.5-194); Green, F. H. M., The climatological work of the Nature Conservancy (abstracted separately). Royal Meteorological Society, Quarterly Journal*, 81(347):108-115, Jan. 1955. DWB—GRAINGER and others (extended summary) described correlations between weather

and yield of barley, bean, oats and wheat at Auchincruive, Ayr. Higher yield is generally associated with lower temperature and sunshine and higher rainfall in June and July. Other papers are abstracted separately. Discussions are summarized. *Subject Headings:* 1. Agricultural meteorology 2. Scotland.—C.E.P.B.

6.5-27

551.5:63:061.1(7)

U. S. Weather Bureau, **Agricultural meteorology development in the Weather Bureau July 1, 1953 to July 1, 1954.** Wash., D. C., July 1954. 11 p. Mimeo. DWB—An outline of the work done during the fiscal year 1953-54 to revitalize the agricultural meteorology work in the U. S., work done in connection with the U.S.D.A., the WMO and the field service of the U. S. Weather Bureau is stressed. A program for the next fiscal year, involving forecast units at key Weather Bureau stations, assigning specialists to experiment stations. Five day forecasts and seasonal forecast, phenological survey and crop weather studies are appended. *Subject Headings:* 1. Agro-meteorological services 2. U. S. Weather Bureau.—M.R.

6.5-28

551.5:633.51

Vámosi, Jenő, **A gyapot terméselrűgás okainak vizsgálata.** [Investigation of the causes of abscission in cotton.] *Időjárás*, 57(6):323-333, Nov./Dec. 1953. 8 tables, 10 refs. Russian and German summaries p. 323. MH-BH—Data obtained in Hungary in several series of observations under natural and experimental conditions show the combined effect of precipitation and of hydrologic properties of the soil on the amount of losses in cotton crops due to abscission. It is found that both excessive and deficient rainfall may cause abscission; the former especially if combined with poor, the latter with good, permeability of the soil. *Subject Headings:* 1. Plant diseases 2. Agricultural hydrology 3. Cotton crop yields.—G.T.

6.5-29

551.5:633.51:06

[U. S. Interdepartmental Committee on Utilization of Weather Bureau Services by Agriculture], **Better utilization of Weather Bureau information for cotton.** [Sept. 1950]. 11 p. Mimeo. DWB—At a meeting of the National Cotton Council, attended by representatives of agencies of the U. S. Dept. of Agriculture and U. S. Weather Bureau and Extensive Service agents in the field (March 30, 1950), a plan was devised for a survey of needs of cotton growers for Weather Bureau Information and Service. This report is a result of that survey. A list of available Weather Bureau forecast data and information services, bulletins, etc. and specialized advisory service which the U. S. Weather Bureau can render in cooperation with Extension agents and B. A. E. employees, is given. Needs of various cotton activities (planting, weed and pest control, irrigation, harvesting, frost damage, etc.) and Weather Bureau officials in 13 southern states are listed. *Subject Headings:* 1. Agricultural meteorology 2. Cotton weather services 3. Southern United States. 1. U. S. Weather Bureau.—M.R.

6.5-30

551.5:92

Gold, E., **Mr. L. G. H. Lee. Obituary.** *Royal Meteorological Society, Quarterly Journal*, 81(347):137-138, Jan. 1955. DWB—Died July 6, 1954, aged 71. Elected Fellow of Royal Meteorological Society 1904. In 1906 became Headmaster of Wesleyan School at Raunds and took charge of station there. Observer in France for Meteorological Section of Royal Engineers, 1915-1919. *Subject Headings:* 1. Obituaries 2. Lee, L. G. H.—C.E.P.B.

6.5-31

551.5:92:389

Mendeleev, D. I., **Metrologicheskie raboty.** [Metrological works.] (His: *Sochineniia* [Collected Works], v. 22. Leningrad. 1950. 866 p. figs., tables, eqs. Price: 45 Rub.) DLC—On p. 58-100 is given an account of author's work on the quantitative determination of the weight of a liter of air. A summary of work on thermometry and barometry is given on p. 172-174. Of course his precise work on physical chemistry and atmospheric physics, calendar reform and on standardization of units of weight and measure between Russian and Western practice occupies the greater part of the book. *Subject Headings:* 1. Metrology 2. Biography 3. Atmospheric physics 4. Mendeleev, D. I.—M.R.

6.5-32

551.5:92

Obituary. Professor Antoni Bolesław Dobrowolski. *Polar Record*, 7(49):343, Jan. 1955. DLC—Polish meteorologist, hydrologist and glaciologist, died April 27, 1954, aged 81. Joined "Belgica" Expedition 1897-99, and wrote up scientific reports. Made a special study of clouds, history of polar explorations, natural history of ice. *Subject Headings: 1. Obituaries 2. Dobrowolski, A. B.—C.E.P.B.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Weather maps** (Gt. Brit. Met. Off.), 6.5-65; **Jet stream** (Riehl, others), 6.5-123; **Heat balance** (Riblet), 6.5-142; **Precip. data** (Szesztay), 6.5-233; **Weather Radar Research** (MIT), 6.5-351.

6.5-33

551.501(26)(09)

Williams, C. H., Old time marine observer's log. (Extracts from meteorological registers kept in observing ships of the year 1855.) Notes on early observing ships. *Marine Observer*, 15(167):21-25, Jan. 1955. 3 plates. MH-BH—Specimen extracts are given from 7 "meteorological registers" for 1855-56, with reproduction of part of that of "Leopard" for Feb. '8, 1856. A list of 14 sailing ships sending logbooks in 1855 is added, with pictures of the "Medway" and "Gloriana." *Subject Headings: 1. Ships' logs 2. Weather ships.—C.E.P.B.*

6.5-34

551.501.1(02)

U. S. Navy, **Aerographer's manual**. 4th ed. *U. S. Office of Naval Operations, NAVAE R* 00-110 R-3, April 1945. Loose-leaf, each section renumbered. Numerous forms, diagrs. DWB—Complete instructions for Navy MH-Aerographers, including chapters on Weather Codes of all types (now obsolete), plotting and analyzing surface and upper air synoptic and aerological charts, temperature measurements, pressure, humidity, surface wind, precipitation, ceiling, upper air winds, radiosondes and airplane soundings, keeping records, administrative details and, finally, various tables, nomograms and computation charts and procedures. The amount of detail is enormous, but the instructions are somewhat out of date. *Subject Headings: 1. Observers manuals 2. Instrument manuals 3. Aerographers manuals.—M.R.*

6.5-35

551.501.1:656.7(02)

U. S. Office of Naval Operations, **Aerographer's mate's workbook, Part I. Surface aviation observations**, adapted for Navy use from U. S. Weather Bureau, Training Paper, No. 9, July 1951. Its NAVAE R 00-80U-23, 1954. 75 p. numerous figs., forms. DWB—A training manual or workbook intended for use by observers and supervisors of those who make surface airways weather observations. It is based on *U. S. Weather Bureau, Circular K*. Many illustrations, sample forms (filled out) and questions (at end of each chapter) are included. *Subject Headings: 1. Airways observers instructions 2. Training manuals.—M.R.*

6.5-36

551.501.3:551.508.41

Bigg, P. H., **New international barometer conventions**. *Nature*, London, 174(4442): 127-1128, Dec. 18, 1954. ref. DWB—Summary of: *British Standard*, No. 2520. Barometer conventions and tables, introduced Jan. 1, 1955. Units: millibar (preferred), mm or inch Hg at 0°C (13.5951 g/cm³) and gravity 980.665 cm/s². The effect of these new international conventions is discussed. *Subject Headings: 1. Units of pressure 2. Barometers.—C.E.P.B.*

6.5-37

551.501.4:551.524

Lucke, O. and Haake, G. R., **Über die Bestimmung des wahren Tagesmittels der Lufttemperatur aus Terminbeobachtungen**. [The determination of the true daily means of air temperature from observation at fixed times.] *Zeitschrift für Meteorologie*, 8(1):16-18, Jan. 1954. table, 3 refs. MH-BH—A comparison is made between four equally spaced observations (introduced into the German Democratic Republic in 1945) and three fixed observations for calculating the true mean daily temperature. An analysis shows that the

former procedure is not essentially superior, particularly in determining the mean annual air temperature. *Subject Headings:* 1. Temperature calculations 2. Mean diurnal temperatures.—*I.L.D.*

6.5-38

551.501.4:551.55

Wyrtki, Klaus, *Graphische Ermittlung des Gradienten eines oben skalaren Feldes und ihre Anwendung zur Bestimmung des Bodenwindes aus dem Luftdruck an drei Stationen* [Graphical calculation of the gradient of a uniform scalar field and its application to the determination of the surface wind from pressure at three stations.] *Annalen der Meteorologie*, 6(5/6):187-188, 1953/54. 2 figs., 4 refs., 3 eqs. MH-BH—A vector construction is given, taking account of gradient wind for the latitude and surface friction, and an example (pressures at Tynemouth, Oksöy and Emden) is worked out on a polar diagram. *Subject Heading:* 1. Wind computation.—*C.E.P.B.*

6.5-39

551.501.42:551.571

Schiess, Josef, *Über die Beseitigung eines grundsätzlichen Fehlers in der Psychrometeortheorie*. [On the elimination of a systematic error in psychrometer theory.] *Annalen der Meteorologie*, 6(5/6):179-185, 1953/54. 6 tables, 14 refs., 22 eqs. German and English summaries p. 184. MH-BH—Improved psychrometric formulas for vapor pressure and relative humidity are derived, taking account of the fact, generally ignored, that the temperature of the original mixture of air and water vapor is reduced from t to t' . Measurements with author's accurate test apparatus (see 5.8-58, Aug. 1954, *MAB*) confirm the accuracy of the new formula within about 0.3% R.H. *Subject Heading:* 1. Psychrometric formulas.—*C.E.P.B.*

6.5-40

551.501.42 531.7

U. S. Office of Naval Research, *Physical constants and conversion factors*. 4th ed. Wash. D. C., Sept. 1953. 1 p. (fold.). DWB—A large wall or desk chart giving numerous standard constants and conversion factors used in radiation and dynamic and synoptic calculations by meteorologists, but mainly in upper atmospheric research. The NACA standard atmosphere data (pressure and speed of sound) are given for 0 to 200,000 ft. *Subject Headings:* 1. Physical constants 2. Conversion tables 3. Standard atmosphere 4. NACA standard atmosphere.—*M.R.*

6.5-41

551.501.45:551.657.3:519.2

Durst, C. S., *Variation of wind with time and distance*. *Great Britain. Meteorological Office, Geophysical Memoirs*, 12(93), 1954. 32 p. 8 figs., 25 tables, 10 refs., 31 eqs. M.O. 584a. DWB—In Pt. I determination of the probable wind is treated as a problem of vector correlation, the elements of which are set out with definitions and examples. Pt. II discusses correlation of upper wind at one time with that at the same place up to 48 hrs later, in various parts of the world. In Pt. III correlations at the same time at places 130 to 1120 naut. miles apart are discussed for various latitudes. Pt. IV applies these results to representing mean winds over an air route. Pt. V considers variation with time and distance combined. In Pt. VI forecasts of upper winds by regression equations are shown to compare favorably with orthodox forecasts and the technique of route forecasting is set out. *Subject Headings:* 1. Upper air wind variations 2. Upper air wind forecasting 3. Vector correlation.—*C.E.P.B.*

6.5-42

551.501.8:551.509

Lugeon, Jean, *La predicción radio-meteorológica del tiempo*. [Radio-meteorological forecasting of weather.] *Onda Corta*, Mexico City, 22(221):74-83, Nov. 1953. figs. DLC—A general article for radio technicians or amateurs, regarding the whole field of radio meteorology and its applications during and after World War II. Reflection of electromagnetic waves from the ionosphere, the atmoradiograph, radiomaxigraph, radiolocation with the radiogoniograph, and uses in forecasting weather or locating storm centers at great distances and, finally, networks for sferics location all over the world and in Argentina in particular, are discussed in separate "chapters," and illustrated. *Subject Headings:* 1. Radio meteorology 2. Sferics networks 3. Weather forecasting.—*M.R.*

6.5-43

551.501.81:551.515.3

Marshall, J. S., **Radar detection of tornadoes.** *Weatherwise*, 7(2):21, April 1954. MH-BH—The identification of tornadoes by radar, though promising, is not conclusive, but the use of radar networks to locate as early as possible the thunderstorms in a tornado danger area, so that these storms may be watched closely for signs of tornado development. Sferics detectors can be used to supplement radar, as the sferics characteristic of tornado storms are different from ordinary thunderstorms sferics. The new radar tornado network in Texas is briefly described in an added note. *Subject Headings:* 1. Radar tornado detection 2. Sferics tornado detection 3. Tornado warning networks 4. Texas.—M.R.

6.5-44

551.501.81:551.515.3

New way to track tornadoes [and] Tornado-expert Flora calls for finances for new warning. *Topeka State Journal*, Topeka, Kansas, March 2, 1954. Abstracted from press clipping. DWB—Newspaper articles mention H. L. JONES' sferics tornado warning device developed at Oklahoma A. and M. A tornado at Norman, Okla., was recorded 90 mi away at Stillwell, Okla., in April 1949 on this kind of device. Rules for avoiding tornadoes or injury from tornadoes are given by R. GARRETT. *Subject Headings:* 1. Sferics tornado detectors 2. Tornado warnings. I. Flora, S. D. II. Jones, H. L. III. Garrett, Richard.—M.R.

OBSERVATIONAL DATA

See also: Altimetry (Bedel), 6.5-181.

6.5-45

551.506.1(87)

551.506.7(87)

***Anuario Meteorológico de Venezuela**, Maracay, Venezuela. 1(1), 1951-. Latest issue received, 3(3), 1952. charts, tables. Issued by Venezuela. Fuerzas Aereas. Servicio de Meteorología y Comunicaciones. Sección de Climatología. DWB—An original and attractive annual summary of the usual meteorological elements, plus the airways data (such as ceiling, visibility, and wind) for 13 airports and aerological data for Maracay. Frequencies and probabilities of precipitation and of thunderstorms for each hour are tabulated for 13 stations, and histograms or other graphs and diagrams presented for a large part of the data included. *Subject Headings:* 1. Annual meteorological reports 2. Airways meteorological data 3. Radiosonde data 4. Venezuela. I. Venezuela. Fuerzas Aereas. Servicio de Meteorología y Comunicaciones.—M.R.

6.5-46

551.506.1(73/9)

*Hawkins, Harry F., Jr. (*Extended Forecast Section*, U. S. W. B., Wash., D. C.), **The weather and circulation of March 1954. A cool March with a 6-day periodicity.** *Monthly Weather Review*, 82(3):80-86, March 1954. 5 figs., table, 13 refs. MH-BH—March was cool after the warmest February on record (62 years) in the U. S. Pacific blocking occurred, similar to that in Jan. 1954 (low zonal circulation). The drought in West Texas, Oklahoma, and Kansas, and eastern Colorado and New Mexico was intensified and resulted in wind erosion damage to 62,000 square miles of land. Rainfall in this area was generally <1.00 in the 4 months Dec.-March. A 6-day cycle in cyclonic passages for previous March 8-April 6, 1954 is shown to have been established with greatest correlation with a fitted 6-day sinusoidal wave occurring at 40°N, 110°W. (At Salt Lake City a correlation of 0.72 for a wave of 8.2 mb amplitude.) *Subject Headings:* 1. Monthly summaries 2. Drought, United States (1953-54) 3. Periodicities 4. United States.—M.R.

6.5-47

551.506.1(426)

Laycock, P. A., **The summer weekends of 1954—how bad were they?** *Weather*, 9(12):368-371, Dec. 1954. 3 tables, 2 refs. DWB—Weather on Saturdays and Sundays May 1-Sept. 26, 1954 at Watford, Herts, is tabulated and weekend rainfall and sunshine compared with 2/7 of monthly totals. Weekend weather was not noticeably worse than other days except for cool weekends in May and wet ones in June and July. *Subject Headings:* 1. Weather reports 2. Watford, England.—C.E.P.B.

6.5-48

551.506.1(46)

*Tortosa, Spain. Observatorio del Ebro, *Boletín del Observatorio del Ebro*, v. 1, 1910-. Latest issue received, v. 36, 1948, pub. 1953. Monthly. mostly tables. 1948 issue has separate data for 12 months, continuous paged with its *Resumen Annual*. 1910-1919 in Spanish and French. Title varies: *Boletín Mensual*. Name of Observatory was formerly Observatorio de Física Cósmica del Ebro. DWB—A verbal summary of the weather of each month is also given. Annual course of major elements as well as upper air wind roses are shown graphically. Most extensive tables for each month, and for each decade and each day, and in most cases each hour of the day during 1948 are given. The elements tabulated are: pressure, temperature, rel. hum., vapor pressure, hours of sunshine, evaporation, rainfall, hydrometeors, wind direction and speed, clouds speed and direction and departures from normal. Precipitation and temperature data are given for each month and the year for 50 other stations in Spain. Frequencies and resultants of winds aloft (to 6 km). *Subject Headings*: 1. Annual meteorological reports 2. Hourly observational data 3. Upper air wind data 4. Tortosa, Spain.—M.R.

6.5-49

551.506.3:551.588.6(729.9)

Macky, W. A., A break caused by insects in the continuity of a climatological record. *Weather*, 9(8):242-243, Aug. 1954. fig. DWB—Station at St. George, Bermuda, was surrounded by Bermuda cedars cut to 8 ft high. In 1949 most of the trees were killed by insects. Dew point and rel. hum. decreased progressively from Oct. 1948 to late 1949, then becoming steady again. Dew point fell by 1.5°F and rel. hum. by 4.8%. Daily range of temperature decreased by 0.8°F. *Subject Headings*: 1. Biological influences 2. Long period records 3. Bermuda.—C.E.P.B.

6.5-50

551.506.8

Koenen, Magda, Gibt es ein "Phänologisches Jahr"? [Is there a "phenological year"?] *Annalen der Meteorologie*, 6(5/6):129-143, 1953/54. 9 figs., fold. plate, 3 tables, 13 refs. MH-BH—Author uses 30-37 years observations of numerous plants (mainly flowering dates) at Geisenheim, Königsberg and Bozen to investigate whether there are natural phenological seasons applicable to different climates. The mean and extreme dates are tabulated; while the means give a general representation the sequence in different regions varies from plant to plant, since climate and location act on different plants differently. It is concluded that phenological seasons are valid for single localities but not for large areas. *Subject Headings*: 1. Phenology 2. Germany.—C.E.P.B.

6.5-51

551.506.8 551.524:634.11

Pearce, S. C. and Preston, A. P., Forecasting the time of blossoming in apple trees from temperature records. *Commonwealth Bureau of Horticulture and Plantation Crops, East Malling, England, Annual Report, 1952/1953*:133-137, pub. 1954. 2 tables, 7 refs. DLC—Writing y = accumulated day degrees above 42°F (Jan. 15–March 15) + $\frac{2}{3}$ (March 16–31) + $\frac{1}{3}$ (April 1–15) and x = accumulated day degrees in June, formulas are found for calculating date of full blossoming of Bramley's Seedling and Worcester Pearmain at various dates Feb. 1–July 1. *Subject Headings*: 1. Accumulated temperature 2. Apple blossoming 3. Phenology.—C.E.P.B.

INSTRUMENTS

See also: Optics and met. of atmos. turbidity (Volz), 6.5-10; Particle size analysis (Inst. of Physics), 6.5-11; Micrometeorology (Johns Hopkins Univ.), 6.5-12; Barometer conventions (Biggs), 6.5-36; Transpiration measurem. (Hesse), 6.5-206; Cu cloud observ. (Malkus), 6.5-229.

6.5-52

551.508.21

Blackwell, M. J., Report on the automatic integration of solar radiation at Kew Observatory. *Great Britain. Meteorological Research Committee, M.R.P. No. 862*, May 12, 1954. 5 p. 5 figs., 4 refs. Mimeo. DWB—Apparatus for obtaining daily values of total

(sun+sky) solar radiation from a Moll-Gorczyński solarimeter by use of an amplifier and integrating motor is described, with method of calibration. The accuracy of the present apparatus is assessed as 2-3%. Future improvements, including a method of obtaining hourly values, are suggested. *Subject Heading: 1. Radiation meters.—C.E.P.B.*

6.5-53

551.508.21(091)

Georgi, Johannes, **Saussure's Heliothermometer**. *Annalen der Meteorologie*, 6(5/6):171-178, 1953/54. 2 figs. In German. MH-BH—A letter from H. B. DE SAUSSURE to the *Journal de Paris*, April 17, 1784, is reproduced, describing experiments and thermometers in cells covered by one or more sheets of glass and exposed at right angles to sun's rays. Temperatures up to 160°C were obtained. Experiments by B. DUCARLA and others are discussed in the letter. Notes are added by GEORGI. *Subject Headings: 1. Radiation instruments 2. History of meteorology. I. de Saussure, H. B.—C.E.P.B.*

6.5-54

551.508.25:551.521.3

MacDowall, J., **A total radiation fluxmeter**. *Meteorological Magazine*, London, 84(993): 65-71, March 1955. 3 figs., 2 photos, 3 tables, 7 refs., 3 eqs. Also as: *Great Britain. Meteorological Research Committee, M.R.P. No. 858, March 24, 1954. 11 p. 11 figs., 4 tables, 5 refs., eqs. Mimeo. DWB*—The instrument, designed to measure net flux of radiation through a horizontal surface near the ground, consists of a freely exposed plate 3" square of thin aluminium sheets separated by bakelite and polythene and blackened on both surfaces. A blower and nozzle direct air symmetrically on both surfaces to minimize effect of variable winds. Temperature difference between two surfaces is measured by an inserted thermopile. Trials are described showing effect of wind speed, aperture, and sensitivity of paint to different wave lengths (0.5-10 μ). Calibration is discussed. Instrument is satisfactory except in rain or fog. *Subject Heading: 1. Radiation flux meters.—C.E.P.B.*

6.5-55

551.508.53/4:621.315

Hartley, G. E. W., **A remote recording electrical anemograph**. *Meteorological Magazine*, London, 84(994):111-115, April 1955. 7 figs., 2 refs. Also as: *Great Britain, Meteorological Research Committee, M.R.P. No. 867, June 9, 1954. 4 p. 10 figs. Mimeo. DWB*—A recorder designed to work with M. O. Generator Anemometer Mk Ib, and modified to give quick response and record gusts accurately, and a system for remote recording of wind direction are described. Both have proved satisfactory; specimen records are shown. *Subject Heading: 1. Distant recording anemographs.—C.E.P.B.*

6.5-56

551.508.53/4:551.524.37

Lugeon, Jean, **L'anémomètre anti-givre de L'Observatoire du Saentis à 2500 M.** [Heated anemometer of the Saentis Observatory at 2500 meters.] Lausanne, 1953. 8 p. 14 figs. At head of t-p: Station Centrale Suisse de Météorologie, Zurich, 1953. Reprint from *Bulletin Technique de la Suisse Romande*, May 16, 1953. DWB—Detailed description and illustration of anemometer, circuits and records as installed at Saentis Observatory, Switzerland, with emphasis on frost removal device which the author and his colleagues developed to cope with extremely heavy deposits of hoarfrost or rime during high winds and sub-freezing temperature. The Robinson anemometer, with electrical recording and hot wire radiant heater to prevent or remove frost, is the basic equipment. Special electric contacts and relays are described and illustrated. The heating is not automatic, but must be turned on by the observers and adjusted to conditions. Three intensities of heating are provided, ranging from 250 w to 1400 w. For rare instances of >100 m.p.h. winds or -18°C temperature >1000 w are necessary. Removal of heavy deposits in 3 minutes are shown (in illustration) to be possible. *Subject Headings: 1. Heated anemometers 2. De-icing of instruments 3. Frost removal 4. Saentis Observatory, Switzerland.—M.R.*

6.5-57

551.508.54

Munro, R. C., **A simple mechanism to improve the sensitivity of a Dines anemograph**. *Royal Meteorological Society, Quarterly Journal*, 80(346):635, Oct. 1954. DWB—Referring to note by A. E. TROLLUND (see item 5.11-43, Nov. 1954, MAB) the method of eliminating

side pressures adopted by R. W. MUNRO, Ltd. is described. *Subject Heading: 1. Dines anemograph.*—C.E.P.B.

6.5-58

551.508.54

Vesseur, H. J. A., *Twee verbeteringen in de registratie van windshelheden met elektrische hulpmiddelen*. [Two improvements in the recording of wind speed by electric means.] (In: Netherlands. (K.) Meteorologisch Instituut, 1854 Koninklijk Nederlands Meteorologisch Instituut, 1954. 'S-Gravenhage, 1954. p. 271-281. 9 figs.) DWB—In the first part of this article a method is given to record the wind velocity, given by a Dines pressure tube anemometer, at a large distance. This is done by means of a servo-mechanism and electronic amplifier. The original pressure tube anemometer is placed as near as possible to the windvane, so the possibility of recording short gusts is fully utilized, without disturbance by long connecting tubes. In the second part an electric circuit is given for direct indication or recording of wind velocity given by a contact-anemometer. The time constant of this circuit can be made as large as 1000 seconds or even larger. So an immediate indication of the mean wind-velocity in the previous ten minutes is given. *Subject Headings: 1. Electric anemometers 2. Wind speed recorders.*—Author's abstract.

6.5-59

551.508.71

Lang, August, *Über neuere Untersuchungen an Hygrometerhaaren*. [On recent investigations on hygrometer hairs.] *Annalen der Meteorologie*, 6(5/6):164-170, 1953/54. 14 figs., 8 refs. German and English summaries p. 164. MH-BH—Requirements of a hair as a hygrometer element are set out. A micrometer for stretch and an apparatus and chamber for testing load capacity are described. Scale properties of a normal hair before and after boiling in salt, Frankenberger's Pernix hair and hairs from Peruvian and Egyptian mummies are compared. Microscopical examination showed that chemical treatment of ordinary hairs can produce large uniform stretch similar to that produced in Peruvian and Egyptian hairs by mummification and age. *Subject Heading: 1. Hair hygrometers.*—C.E.P.B.

6.5-60

551.508.72

Renqvist, Henrik, *Evaporation recorder*. I.U.G.G. Association of Scientific Hydrology, Brussels, 1951, [Transactions], v. 3:473, pub. 1952. diagr. DWB—Description with sketch of an automatic recorder for evaporation from soil surfaces, continuously weighing a tank of 1 m³ capacity filled with earth. Oscillations due to wind drag are diminished by a damping system operating with oil resistance. *Subject Heading: 1. Evaporation recorders.*—A.A.

6.5-61

551.508.822

Painter, H. E., *Radio-sonde calibration plant*. *Meteorological Magazine*, London, 84(991): 14-17, Jan. 1955. 4 plates. DWB—The methods of calibrating about 17,000 radiosondes a year in a new temperature and pressure calibration plant in the British Meteorological Office are described and illustrated. Temperatures can be obtained accurately from +48°C down to -85°C (with solid CO₂ and trichlorethylene). Two operators can calibrate 18 temperature units in a half-hour or 30 pressure units in one hour. *Subject Headings: 1. Calibration equipment 2. Radiosondes.*—C.E.P.B.

6.5-62

551.508.822:551.508.94:551.594.11

Koenigsfeld, L. and Piraux, Ph., *Un nouvel électromètre portatif pour la mesure des charges électrostatiques par système électronique*. Son application à la mesure du potentiel atmosphérique et à la radiosonde. [A new portable electrometer for measuring electrostatic charges by electronic means. Its application to the measurement of atmospheric potential and to radiosondes.] Belgium. Institut Royal Météorologique, Mémoires, Vol. 45, 1951. 21 p. 11 figs. DWB—Various systems of measuring atmospheric electric potential are first mentioned, and then the author's new system using an HL-23 Valve (tube) electrometer described and illustrated in detail, including the theory, calibration and operation of the equipment. Adaptation of this system to the U. S. Signal Corps radiosonde by VENKITESHWARAN et al (1953) is mentioned in 5.1-307 and 5.8-275, Jan. and Aug. 1954, MAB. Finally, the adaptation of the electrical circuits and mechanism of the British radiosonde to allow

for registration of potential at high altitudes is treated in the same detailed manner. Five ascents were made between Feb. 15 and May 7, 1951 and results of 4 successful soundings (to 17.5 km) shown graphically. One flight through overcast with thunderstorms in the vicinity shows a remarkable increase in potential from 2-5 km in contrast to rapid drop from surface to 2 km on a clear day. *Subject Headings:* 1. Electrometers 2. Radiosondes conductivity measurements 3. Atmospheric potential gradient soundings—*M.R.*

6.5-63

551.508.94 551.594.12

Martinoli, Carlos A. M. (*Argentine Met. Service*), **Nuevo método para la determinación de la relación de capacidades en el aspirador Gerdien**. [New method for measuring the electrical capacity ratio in the Gerdien ion-aspirator.] *Meteoros*, Buenos Aires, 3(4):429-432, Oct./Dec. 1953. fig. Spanish and English summaries p. 429. **MH-BH**—A new method for measuring the electrical capacity ratio in the Gerdien ion-aspirator is described. It is based on the electrical tension division which occurs in the condensers connected in series. *Subject Headings:* 1. Ion measurement 2. Atmospheric electricity instruments 3. Ion aspirators.—*Author's summary.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: Radiomet. forecasting of weather (Lugeon), 6.5-42; *Upper level troughs* (Smith, Forsdyke), 6.5-127; *Synoptic analysis* (Penner), 6.5-137; *Illumination forecasts* (Wörner), 6.5-150; *Upper air observ.* (Doporto), 6.5-311.

6.5-64

551.509:551.515.13

Schwerdtfeger, Werner, **Valoración de posibles observaciones meteorológicas en el Océano Pacífico, al oeste de Chile, para la prevision del tiempo en la Argentina**. [Evaluation of possible meteorological observations in the Pacific Ocean, to the west of Chile, for weather forecasting in Argentina.] *Meteoros*, Buenos Aires, 4(1/2):99-104, Jan./June 1954. fig., 3 tables, 8 refs. **DWB**—The atmospheric conditions of the Northern and Southern Hemispheres are compared on the basis of data representing the steering currents of the middle and subtropical latitudes obtained at stations recording the winds aloft by means of radar. Larkhill is approximately at the same latitude as Malvinas in the Southern Hemisphere; Lerwick is included since its meteorological and aerological characteristics resemble those at the southern extremity of South America. It is shown that the importance of a knowledge of the synoptic situation over the adjacent seas to the west (Pacific Ocean) is greater, the greater is the frequency of the steering currents from the western sector and that for improving weather forecasting in extra-tropical South America synoptic observations over the southern Pacific are more important than corresponding observations over the northern Atlantic for European weather forecasting. *Subject Headings:* 1. Weather forecasting 2. Steering currents 3. Forecast improvement 4. Argentina.—*I.L.D.*

6.5-65

551.509.1:551.501.3

Great Britain. Meteorological Office, **Instructions for the preparation of weather maps with tables of the specifications and symbols**. 2nd ed. London, 1954. 49 p. figs., 6 tables. *M.O.* 515. **DWB**—Instructions are given for decoding synoptic code messages of surface observations from land stations and ships. Examples of the station model for plotting are shown, with symbols for wind, past and present weather, atmospheric and fronts. An appendix (p. 17-49) details the codes and specifications for all forms of surface reports including ships' reports. *Subject Headings:* 1. Synoptic codes 2. Synoptic diagrams.—*C.E.P.B.*

6.5-66

551.509.21

Gherzi, Ernest, **Unrealistic weather maps over continents**. *Weather*, 9(12):386-387, Dec. 1954. **DWB**—The practice of drawing pressure maps reduced to sea level over high plateaus such as Baikal region leads to a wrong impression of the weather processes. *Subject Heading:* 1. Synoptic charts.—*C.E.P.B.*

6.5-67

551.509.31:551.583

Ehrlich, Albert, **Synoptic patterns associated with singularities in the Northeastern Atlantic.** *American Meteorological Society, Bulletin*, 35(5):215-219, May 1954. 12 figs., table, 3 refs. **MH-BH**—This study attempts to determine whether particular synoptic patterns tend to be associated with certain calendar dates. Five-day means of sea-level pressure computed for 10-degree intersections over the North Atlantic for each of the 40-year period, 1899-1938, and averaged over 40 years were grouped and the deviations from a smooth curve which were greater in the North Atlantic than in other parts of the Atlantic were correlated with synoptic patterns over the North Atlantic for the winter season. The total number of ridges or troughs occurring within four days of the mean date was used as representative of a given day. Mean charts for various dates were computed and are shown. Agreement between singularities listed by C. E. P. Brooks and synoptic pattern is indicated. *Subject Headings*: 1. Singularities 2. Synoptic patterns 3. Synoptic studies 4. North Atlantic.—*I.L.D.*

6.5-68

551.509.31:551.515.2

Takahashi, Kamekiti (*Met. Res. Inst., Tokyo*), **Techniques of the typhoon forecast.** *Geophysical Magazine*, Tokyo, 24(1):1-8, Aug. 1952. 7 figs., 4 tables, 7 refs. **MH-BH**—Both the number of persons killed and the number of houses destroyed are proportional to the duration of the typhoon and its kinetic energy $K = 0.36 \times 10^{22} (1010 - p_c) R^2$ [erg]; p_c = central pressure [mb]; R = radius of the typhoon. Statistical relations for these parameters are given as well as for the pressure and wind distributions. It is shown how to estimate the central pressure from scattered observations, and how to find the direction and speed of typhoon movement, which is correlated to the 500 mb air current and the temperature gradient at the surface, but has no relation to surface pressure pattern. The typhoon tends to move towards the rainy area. Relation to vorticity is shown. *Subject Headings*: 1. Typhoon statistics 2. Typhoon forecasting 3. Vorticity 4. Typhoon damage 5. Japan.—*A.A.*

6.5-69

551.509.312

Eady, E. T., **Numerical weather prediction.** *Science Progress*, 43(169):72-81, Jan. 1955. 12 refs. **DWB**—Difficulties of the present essentially empirical method of forecasting are due to the number of possible developments of any situation. The machine problem is to arrange equations of large-scale flow in a form suitable for solution by finite steps. Errors are: data errors, errors of idealized model, and errors due to limitations of the computation process or to computational instability. The possibility of reducing the last-mentioned group without unduly increasing machine computation time are considered. Probable future developments are discussed. *Subject Heading*: 1. Numerical forecasting.—*C.E.P.B.*

6.5-70

551.509.312:551.511

§Kerr, I. S., **Some examples of 500 mb prognoses by Fjörtoft's graphical method.** *New Zealand. Meteorological Service, Technical Note*, No. 112, 1954. 8 p. figs., 2 tables, refs., 8 eqs. **DWB**—The graphical method of integration of the barotropic vorticity equation due to FJORTOFT (1952) has been applied on ten occasions. The results are illustrated and discussed. Although the 500 mb prognostic maps produced by the method were superior, probably in significant degree, to those obtained by the usual extrapolation methods, it is doubtful if the superiority is sufficiently great to justify the time and labor involved in routine application of the method. *Subject Headings*: 1. Numerical forecasting 2. Vorticity equations 3. Prognostic charts.—*Author's abstract.*

6.5-71

551.509.312

Newton, C. W., **Analysis and data problems in relation to numerical prediction.** *American Meteorological Society, Bulletin*, 35(7):287-294, Sept. 1954. 5 figs., 12 refs. **MH-BH**—Instantaneous height tendencies computed from different analyses of the same 500-mb chart illustrate that discrepancies in analysis or observations can have a serious effect on the accuracy of numerical forecasts. The present status of the Northern-Hemisphere aerological network is reviewed, stressing the inhomogeneity of the radiosonde network, the need for observations in fringe areas surrounding the present dense networks, and the desirability of

more radio-wind stations. The suggestion is made that machine prognoses incorporating variations of fictitious observations could be used to evaluate the improvements needed and the desirability of setting up new aerological stations in particular locations. *Subject Headings:* 1. Numerical forecasting 2. Forecast improvements 3. Meteorological networks.—*Author's abstract.*

6.5-72

551.509.312:551.515.11

§Petterssen, Sverre; Dunn, Gordon E. and Means, L. L., **Report of an experiment in forecasting of cyclone development.** *Journal of Meteorology*, 12(1):58-67, Feb. 1955. 25 figs., 2 tables, 2 refs., 3 eqs. DWB—Petterssen's hypothesis (p. 36-42, *see item* 6.5-124) is formulated as: "cyclonic development at sea level occurs when and where an area of positive vorticity advection in the upper troposphere becomes super-imposed upon a frontal zone at sea level." It is illustrated by a series of charts of the storm of Nov. 23-27, 1952. The hypothesis was applied qualitatively in 24 hour forecasts of cyclogenesis or cyclone intensification (example Jan. 12-13, 1954). Results were very good; out of 97 verifiable forecasts 79 were successful and only 12 definitely failed. *Subject Headings:* 1. Differential kinematics 2. Cyclogenesis 3. Forecasting cyclone development.—*C.E.P.B.*

6.5-73

551.509.33

Manohin, V., **Prognose für den bevorstehenden Winter 1953/1954.** [Forecast for the coming winter 1953/1954.] *Wetter und Leben*, 5(11/12):226-228, Dec. 1953. 4 tables. MH-BH—On the basis of a hundred years of temperature data for Ljubljana the author found that the mean winter temperature repeats itself after 83 years and that cold winters have a cycle of 49-50 years. Accordingly the forecast is made that at Ljubljana the winter 1953/54 will be cold with above normal precipitation. *Subject Headings:* 1. Seasonal forecasting 2. Temperature cycles 3. Ljubljana, Yugoslavia.—*I.L.D.*

6.5-74

551.509.33

Müller-Annen, Hans, **Langfristvorhersagen meteorologischer Elemente mit Hilfe von Autokorrelation und Buys-Ballot'schem Schema.** [Long-range forecasting of meteorological elements with the aid of autocorrelation and the Buys-Ballot scheme.] *Annalen der Meteorologie*, 6(5/6):144-150, 1953/54. 3 figs., 2 refs. German and English summaries p. 144. MH-BH—Formal autocorrelation takes too long for forecasting. A rapid method is to join a series of observations by a curve which is then copied on tracing paper. The trace is moved to the right until as much agreement as possible is found between the two curves. Successive displacements give lengths of 1-3 quasi-periodicities with sub-harmonics. The Buys-Ballot numerical method is then used to determine the periodicities accurately and extrapolate them. Examples of forecasting precipitation and temperature for a month are given, using periodicities of 109, 80 and 64 days, but in general shorter waves (up to 36 days) are more reliable. *Subject Headings:* 1. Long range forecasting 2. Periodicities. I. Buys-Ballot, C. H. D.—*C.E.P.B.*

6.5-75

551.509.33

Thirty-day forecasting. *Meteorological Magazine*, London, 84(991):18-23, Jan. 1955. 5 refs. DWB—The discussion was opened by J. H. BRAZELL with an account of: NAMIAS, J., **Thirty-day forecasting: A review of a ten-year experiment**, (*see* 5.3-9, March 1954, *MAB*) which relies on determining tendencies from 30-day mean 700 mb charts. Other speakers referred to the work of the Long-Range Forecasting Research Branch and Forecasting Research Division at Dunstable, and to possible "physico-climatological" methods. The general view was that no sound basis for long-period forecasting has yet been found. *Subject Headings:* 1. Long range forecasting. I. Brazell, J. H. II. Namias, J.—*C.E.P.B.*

6.5-76

551.509.33:551.543.3

Wadsworth, J., **Pressure waves and symmetry points.** *Meteorological Magazine*, London, 84(991):9-14, Jan. 1955. 3 figs., 11 refs. DWB—Argues in favor of the possibility of extended forecasting by pressure waves and symmetry points. As examples are shown Northern Hemisphere phase and amplitude charts of 36- and 24-day waves in Oct. Dec., 1932 (Polar Year) and a series of daily surface isobar charts showing approximate reflection about sym-

metry points of Nov. 25 and Dec. 31. *Subject Headings:* 1. Symmetry points 2. Pressure waves.—C.E.P.B.

6.5-77

551.509.54 551.578.4:551.591

Richards, T. L., *Approach to forecasting snowfall amounts. Canada. Meteorological Div., Cir-2421, TEC-177, Jan. 19, 1954.* 3 p. 3 charts. DWB—A method is developed for correlating visibilities in snowstorms with amount which will be expected to fall. Hourly reports from Malton Airport were used for the 4 winter months Dec.-March for 1941-1952. When hourly rates of snow accumulation were plotted against visibility alone a considerable scatter resulted, but by separating cases when haze or fog prevailed (when visibility prior to snow was 6 miles or less) a better correlation was found. In addition to smooth central curve, the two curves limiting 85% of cases were also drawn in scatter diagrams. Blowing snow and/or surface wind >19 mph were reported. Considerations of temperature and temperature dew point spread gave no further improvement. *Subject Headings:* 1. Snowfall-visibility relationships 2. Snowfall amount forecasting 3. Malton Airport, Toronto, Canada.—M.R.

6.5-78

551.509.54

Schwerdtfeger, Werner, *Aplicación de métodos objetivos a la previsión de lluvias en Buenos Aires.* [Application of objective methods of rain forecasting in Buenos Aires.] *Meteoros*, Buenos Aires, 4(1/2):7-34, Jan./June 1954. 6 figs., 11 tables, 21 refs. Spanish and English summaries p. 7. DWB—The use of a confidence factor to indicate the probability of the occurrence or nonoccurrence of rain in different synoptic situations is proposed on the basis of results obtained through objective forecasting. The principles of the objective method are outlined and its application to the occurrence of rainfall classified according to distribution and intensity is illustrated. The main independent parameters are a classification of the daily synoptic situation and pressure and wind conditions at 2000-2500 m to the west and north of the area under consideration. The results of correlation of rainfall of one and two days in Buenos Aires with more important parameters and of short range forecasting of days with or without rainfall are presented and the possible influence of chance and the effect of persistence are examined. The objective method is applied to extended forecasting of rainless periods of several days by the use of regional circulation indices as independent parameters. *Subject Headings:* 1. Rainfall forecasting 2. Objective forecasting methods 3. Buenos Aires, Argentina.—I.L.D.

6.5-79

551.509.58:551.515.53:629.13

Creswick, William S., *Forecasting for high level flight. Canadian Aviation*, Toronto, 27(2):26-27; 32-44, Feb. 1954. photos. DWB—Technical particularities of high-level flight with conventional and jet aircraft, and weather factors affecting effective flight operation are discussed. The meteorological factors discussed in particular are temperature, winds, turbulence, clouds, icing and visibility. Requirements of accuracy in forecasting these factors are considered with particular emphasis on the multiple tasks meteorologists are expected to face owing to the advent of high-level flying. *Subject Heading:* 1. Aeronautical meteorology.—G.T.

CLOUD SEEDING AND ARTIFICIAL PRECIPITATION

6.5-80

551.509.67

Krick, Irving, *Topics in address by Dr. I. Krick at Brandon, Manitoba, Canada, March 26, 1954. Canada. Meteorological Div., Circular 2479, Pub. 175, May 5, 1954.* 5 p. DWB—Comments by KRICK are extracted from his speech to farmers in SW Manitoba in which he: 1) denied ability to "produce rain" but merely to increase rainfall when it already occurs in an area; 2) explains ability to prevent hail; and 3) denies possibility of "overseeding" clouds. He also claims responsibility for present-day methods of long range forecasting. Results of previous years of AgI seeding in the Brandon area are summarized and comments by ANDREW THOMSON appended. *Subject Headings:* 1. Cloud seeding with silver iodide 2. Brandon, Manitoba. I. Thomson, Andrew.—M.R.

6.5-81

551.509.67:061.3

Murgatroyd, R. J., **International Symposium on Experimental Meteorology**, Zurich, October 4-6, 1954. *Meteorological Magazine*, London, 83(990):374-375, Dec. 1954. DWB—Organized by the Swiss Federal Commission for the Study of Hail Formation and Prevention, the symposium heard numerous papers on physics of cloud and rain, condensation and freezing nuclei, etc. These will be published in a special issue of *Archiv für Meteorologie, Geophysik und Bioklimatologie*. *Subject Headings*: 1. Artificial precipitation 2. Condensation nuclei 3. Symposia.—C.E.P.B.

6.5-82

551.509.67

Quate, Boyd, **Weather modification as applied to hail storms**. *National Association of Mutual Insurance Companies, Fifty-seventh Annual Convention, San Francisco, California, Oct. 11-15, 1953, Proceedings and Papers*, p. 192-195. DWB—Contains an account of the origin of the Water Resource Development Corporation of which IRVING P. KRICK is president and a simplified account of cloud seeding with silver iodide, the relationship between ice-crystal formation and precipitation, and the possible use of AgI cloud seeding to reduce hail-stone size and to diminish hail damage. *Subject Headings*: 1. Cloud seeding with silver iodide 2. Hail prevention 3. Hailstone size modification.—I.L.D.

6.5-83

551.509.67

U. S. Congress. Senate. Committee on Appropriations, **Third supplement appropriation bill, 1954**. *Hearings before the Committee, 83rd Congress, Second Session, on H.R. 4841*. Wash., D. C., Govt. Print. Off., 1954. p. 60-69 treat requested budget for the Advisory Committee on Weather Control. DLC—This presentation of the budget request of the Advisory Committee on Weather Control contains a statement of the program of the Committee, a description of planned composition of its staff, a statement by the Department of Agriculture on the importance of weather modification, in particular artificial rainfall to agriculture, a brief statement on the extent of cloud seeding operations carried on in the U. S. and abroad, and short biographical sketches of the private and public members of the Committee. *Subject Headings*: 1. U. S. Advisory Committee on Weather Control 2. Weather control budget 3. Cloud seeding 4. Biography.—I.L.D.

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

ATMOSPHERIC POLLUTION

See also: **Particle size analysis** (Inst. of Physics), 6.5-11; **Radioactive dust** (Chatterjee, others), 6.5-339; **Transport of atomic debris** (List), 6.5-342; **Thermonuclear weapon** (Nag Choudhury), 6.5-345.

6.5-84

551.510.41:546.49

Aruin, A. S., **Opređenje rtuti v atmosferom vozduke**. [Determination of mercury in the atmosphere.] *Gigiena i Sanitariia*, No. 5:46, May 1954. DLC—After pointing out the deficiencies in N. G. POLEZHAEV's method for determining mercury in the atmosphere, the author describes the method developed by M. A. PETROV. This method is based upon the reactions of the mercury ion with Reinecke salt to form in acids an insoluble compound having the composition $\text{NH}_4(\text{CNS})_4\text{Cr}(\text{NH}_3)_2$. The procedure underlying this method is described in detail. *Subject Headings*: 1. Mercury in the atmosphere 2. Mercury measurement.—I.L.D.

6.5-85

551.510.41:546.214

*New Mexico. University, **Investigation in the physics of atmospheric ozone**. Contract W28-099 ac-379, Interim Reports, No. 1-11, Jan. 1-March 31, April 1-June 1, July 1-Sept. 1, Oct. 1, 1948-Dec. 31, 1948 to July 1-Sept. 30, 1950, pub. Dec. 31, 1948 to Oct. 5, 1950. 11 pieces. figs., refs. DWB—Work over a period of more than 2 years in the fields listed below is reported in this series of "progress reports." 1) Vertical distribution of temperature in

relation to O_3 distribution, 2) amount of surface O_3 , 3) technique for recovery of balloon-borne instruments, 4) investigation of methods for detecting O_3 used in SW Germany, 5) vertical distribution of O_3 in troposphere and stratosphere, respectively, 6) development of surface, balloon-borne, airborne and mountain peak O_3 measuring equipment of several types. Theoretical investigations were undertaken as well as the chemical and spectrographic measurements. Scores of line or wiring diagrams of equipment and graphs of resulting data are included. *Subject Headings:* 1. Ozone investigations 2. Ozone data 3. New Mexico. I. Regener, Victor H.—M.R.

6.5-86

551.510.41:546.214

Sekihara, Kyo (*Met. Res. Inst., Japan*), **On the chemical determination of atmospheric ozone at the summit of Mt. Fuji.** *Meteorological Society of Japan, Journal*, 2nd Ser., 32(4): 111-116, April 1954. 4 figs., 6 refs. In Japanese; English summary p. 111. **MH-BH**—An electrochemical apparatus for the measurement of atmospheric ozone which was originally developed by A. EHMERT was constructed, and practical observation with it were carried out three times a day at the summit of Mt. Fuji from 13th to 18th of August 1953. According to the results of observation, the ozone concentration increases anomalously before the occurrence of St. Elmo's fire. A notable decrease which is presumably related with the passage of frontal zone was also observed. EHMERT's method of determination of atmospheric ozone is criticized from the viewpoint of meteorological observation. *Subject Headings:* 1. Chemical ozone determination 2. Ozone measurements 3. Ozone concentration 4. Mt. Fuji, Japan.—*Author's abstract.*

6.5-87

551.510.42:57

Asset, Gabrielle and Pury, Doris, **Deposition of wind-borne particles on human skin.** *Archives of Industrial Hygiene and Occupational Medicine*, Chicago, 9(5):273-283, April 1954. 3 figs., 5 tables, 11 refs. **DLC**—The experiments on the deposition of spherical organic particles of triphenyl phosphate upon human skin were carried out in a wind tunnel at horizontal winds with velocities of 2 to 5 mph. Exposures were made on the forearms of male subjects, for purposes of comparison. A glass cylinder was also used. No deposit was detectable on glass; but significant amounts of triphenyl phosphate were found on the hairy surfaces of the forearms when facing the wind. Very little aerosol was deposited on the downwind side. The efficiency of depositions increased with wind velocity and particle size. *Subject Headings:* 1. Atmospheric pollution 2. Aerobiology 3. Industrial meteorology.—I.L.D.

6.5-88

551.510.42

Barad, Morton L. (*U. S. A. Force, G.R.D.*) and Shorr, Bernard (*General Electric Co., Richland, Wash.*), **Field studies of the diffusion of aerosols.** *American Industrial Hygiene Association, Quarterly*, 15(2), June 1954. (5 p. unnumbered, from reprint). 7 figs., 2 refs. **DSG**—Oil fog aerosol was released from a 185' level, measuring the distribution of puffs reaching the ground under superadiabatic conditions. The data indicate that the most frequent ground reaching distance increases roughly linearly with the wind at the 200 m level. The distribution of ground level concentration was measured by a portable sampling unit, which is based upon the fluorescent property of oil. Sampling times of at least one hour are necessary in order to find the distribution. *Subject Headings:* 1. Aerosol diffusion 2. Atmospheric pollution 3. Oil fog 4. Hanford, Wash.—A.A.

6.5-89

551.510.42

*†Hewson, Edgar Wendell, **Some aspects of the dispersion of pollens and industrial contaminants in relation to micrometeorology.** Michigan. Univ. Engineering Research Institute, Contract AF 19(604)-792, Scientific Report, No. 1, Oct. 1953. 44 p. 6 figs., 3 tables, bibliog. p. 41-44. **MH-BH**—The author summarizes and analyzes critically and systematically the results of past investigations on the following aspects of atmospheric pollution: 1) Effects on climate (radiational effects of CO_2 , dust and smoke, and nucleating effects), 2) Effects on health of smoke, SO_2 , allergens, etc., and limitations of pollen measurements, 3) Effectiveness of natural cleansing processes (for CO_2 , SO_2 , smoke and allergens), and 4) Problems of pollution in relation to climatic change, health and natural removal. It is

concluded that CO_2 is the only element that is not being removed naturally as fast as it is produced artificially. Other factors may be injurious to health, however. *Subject Headings:* 1. Atmospheric pollution 2. Dispersion of contaminants 3. Public health.—*M.R.*

6.5-90

551.510.42:551.575.1:357.1

The Beaver interim report, "No material improvement unless. . . ." *Smokeless Air*, No. 89:116-119, Spring 1954. photo, fig. Also: Statement by the Minister of Housing and Local Government to the House of Commons, 2nd December, 1953. *Ibid.*, 120-121; and Memorandum to the Beaver Committee. *Ibid.*, No. 90:175-190, Summer 1954. 4 refs.; Manchester and the Beaver Committee. *Ibid.*, 193-194; and The Beaver report. A preliminary review. *Ibid.*, No. 92:74-76, Winter 1954. DWB—The Interim Report of the Beaver Committee (Cmd 9011 HMSO) is summarized, including: precautions to avoid worst effects of severe smog; technical survey of nature, sources, amount and prevention of air pollution, including a reference to CO; practical conclusions and difficulties to be overcome. A chart shows pollution by smoke, grit and sulfur due to various sources. The Minister's statement describes action already taken, including fog warnings and resulting action, and industrial action recommended. The Memorandum outlines the proposals of the National Smoke Abatement Society for action against all sources of pollution. These include improvement of fuel and of fuel-burning plant, research into causes of pollution and more action by local authorities and industry. New legislation along certain lines is suggested. Attention is called to some special problems and suggestions are made for educating public opinion. Appendices deal with smokeless zones, prior approval for fuel-burning installations, and legislation in the United States and Canada. A memorandum by P. B. DINGLE and C. METCALFE BROWN refers to Manchester's experience of smokeless zones and prior approval. The last article is a short discussion of "Report of the Committee on Air Pollution." Economic cost of smoke to Britain is estimated as £250 million a year. Recommended new legislation is summarized. *Subject Headings:* 1. Atmospheric pollution 2. Smoke abatement 3. Beaver Reports 4. England.—*C.E.P.B.*

6.5-91

551.510.42:551.575.1:614.7

The Ministry of Health report on London smog. *Smokeless Air*, No. 92:101-103, Winter 1954. 2 refs. DWB—Summary of "Reports on Public Health and Medical Subjects, No. 95," by a Committee appointed in 1953 to study London fog of Dec. 1952. It deals mainly with increased death and sickness rates. *Subject Headings:* 1. Smog 2. Public health 3. London, England.—*C.E.P.B.*

6.5-92

551.510.42

*Singer, Irving A., Comparison of computed and measured ground-level dose rates from radioargon emitted by the Brookhaven reactor stack. *U. S. Brookhaven National Laboratory, BNL 292, T-49, May 1954.* 42 p. 30 figs., 8 tables+extensive tables in appendixes, 16 refs., eqs. DWB—The nuclear reactor at Brookhaven National Laboratory is air-cooled and consequently measurable amounts of radioargon (A^{41}) are emitted into the atmosphere. By a combination of theory and experimental data obtained from oil fog concentration measurements, an approximate solution to the problem of determining dose rates from the radioargon under various meteorological conditions has been obtained. The purpose of the paper is to compare the calculated values with measured weekly and hourly values of A^{41} at eight Health Physics stations. *Subject Headings:* 1. Radioargon concentration 2. Atmospheric pollution 3. Industrial hygiene 4. Brookhaven, N. Y.—*Author's abstract.*

6.5-93

551.510.42

Singer, Irving A. and Smith, Maynard E. (*Brookhaven National Lab.*), The use of averages in air pollution meteorology. *Air Repair*, Pittsburgh, 3(3):201-204, Feb. 1954. 5 figs., table, 6 refs. DWB—In a brief analysis of the gustiness classification prepared as a result of a two-year study completed at Brookhaven National Laboratory the author presents graphical evidence to the effect that "average conditions as presented in some of the more important papers on atmospheric dispersion should not necessarily be considered as most probable." *Subject Headings:* 1. Atmospheric pollution 2. Statistical analysis.—*G.T.*

6.5-94

551.510.42

Smog scramble spans nation. *Chemical and Engineering News*, 32(12):1108-1113, March 22, 1954. 7 photos. **DLC**—A detailed summary of air pollution research and control activities in the East, Midwest, Gulf Coast, South, Los Angeles, Oregon and Washington State areas, the effect on health and problems of technical and legal nature. Work of Stanford Research Institute in research and especially their aerosol camera for photographing aerosols in flight is mentioned. Oregon is the first and only state to set up an Air Pollution Control Act (Aug. 1951) and Commission. In Alaska the emission of pure water vapor pollutes the air at low temperatures by increasing fog, reducing visibility and delaying air transportation. *Subject Headings:* 1. Atmospheric pollution research 2. Atmospheric pollution control 3. United States 4. Alaska.—*M.R.*

6.5-95

551.510.42:551.552

Southern California Air Pollution Foundation, Los Angeles, Balloon network supports test by smog air tracers. *Its Release*, Sept. 6, 1954. 2 p. Mimeo.—Gives details of intensive aerological observation program conducted in the Los Angeles Basin by the Foundation in cooperation with other agencies. *Subject Headings:* 1. Atmospheric pollution 2. Wind effects 3. Aerological networks 4. Los Angeles, Calif.—*G.T.*

6.5-96

551.510.42

Southern California Air Pollution Foundation, World's biggest air laboratory test begins. *Its Release*, Aug. 9, 1954. 2 p. Mimeo.—Announces large-scale special air pollution survey program to be jointly conducted by Southern California Air Pollution Foundation and Los Angeles Air Pollution District. The aerometric survey will comprise continuous measurements of air pollutants and oxidants during 4 months in a variety of locations. Mechanical analyzers will be used in computing the data. One phase of the project will consist in collecting air-tracer particles dispersed in order to determine the relation of the propagation of pollutants to wind trajectories. *Subject Headings:* 1. Atmospheric pollution 2. Los Angeles, Calif.—*G.T.*

6.5-97

551.510.42:551.510.53:551.576.1

Volz, F., Stratosphärische Dunstwolken im Juli 1953. [Stratosphere haze clouds in July 1953.] *Meteorologische Rundschau*, 7(9/10):185, Sept./Oct. 1954. 6 refs. **DWB**—The haze cloud reported by L. JACOBS at 15 km over Britain on July 27-30, 1953, was also seen over Mainz. Its wave structure, particle size, density and optical effects are described. *Subject Heading:* 1. Stratospheric dust clouds.—*C.E.P.B.*

6.5-98

551.510.42:628.53

Von Hohenleiten, H. L. and Kent, R. H., Economic and engineering considerations in the design of stacks for good gas dispersion. *Air Repair*, Pittsburgh, 3(3):195-200, Feb. 1954. 5 figs., 2 tables, 9 refs. **DWB**—Stack height and outlet velocity are the two major engineering factors affecting dispersion of gases and pollutants from industrial plants. In addition to these factors the author discusses the effect of geographic location, wind direction, etc. Wind tunnel tests for studying the turbulence pattern of power plant structures are described. *Subject Headings:* 1. Atmospheric pollution 2. Stack effluents.—*G.T.*

6.5-99

551.510.42:551.574.1(431)

Würfel, H., Ergebnisse einjähriger Messungen des Kerngehalts der Luft am Rande der Grosstadt Berlin. [A year of measurement of nuclei content of the air on the edge of Berlin.] *Angewandte Meteorologie*, 1(11):333-342, Nov. 1953. 6 figs., table, 12 refs. **MH-BH**—Nuclei counts at Buch on north edge of Berlin, 4 times daily, are plotted and compared with wind direction and speed. They are greatest (20-22,000/cc) with winds from the city, least (10-12,000) from open country. Seasonal differences of monthly averages reflect seasonal variations of wind direction. Winds from open country showed greatly decreased pollution with increased strength, those from town only a slight decrease. *Subject Headings:* 1. Atmospheric pollution 2. Nuclei count 3. Berlin, Germany.—*C.E.P.B.*

ATMOSPHERIC STRUCTURE

See also: **Earth's atmos. and counter glow** (Hope), 6.5-8; **Solar-terrestr. parameter** (Adel), 6.5-141; **Temp. changes** (Pressman), 6.5-165; **Upper atmos. research** (Temple Univ.), 6.5-356; also special bibliography on **Photochemistry of the upper atmosphere**, p. 660.

6.5-100

551.510.5

*U. S. National Advisory Committee for Aeronautics, **Manual of the ICAO Standard Atmosphere. Calculations by the NACA.** Its *Technical Note*, 3182, May 1954. 132 p. figs., mostly tables, 11 refs. Manual (draft of Dec. 1952) reproduced p. 1-19; Calculations, p. 21-125. DWB—The physical constants and basic equations defining the International Civil Aviation Organization (ICAO) Standard Atmosphere are presented together with tables and diagrams of the properties of the ICAO Standard Atmosphere computed by the National Advisory Committee for Aeronautics in both metric and English units for altitudes from -5000 m to 20,000 m and from -16,500 ft to 65,800 ft. *Subject Headings:* 1. ICAO standard atmosphere 2. Standard atmosphere. I. International Civil Aviation Organization.—*NACA abstract.*

6.5-101

551.510.52/3

*Gabites, J. F. (*Met. Office, Wellington*), **Temperatures in the troposphere and lower stratosphere over the New Zealand region.** *New Zealand. Meteorological Office, Note*, No. 39, 1953. 4 figs., 5 tables, 9 refs. Also in: *New Zealand Journal of Science and Technology, Sec. B*, 35(2):213-224, Sept. 1953. DLC—Monthly mean temperature at 700, 500, 300, 200 and 100 mb for Nandi, Fiji; Norfolk Island, Auckland, Hokitika, Taieri and Invercargill are tabulated, analyzed and shown on diagrams. The mean tropopause height, pressure and temperature and the seasonal frequencies of tropopause pressure are also tabulated for each month for 5 of these stations. The climatological tropopause is used for the mean values and all tropopauses in computing frequency data. The climatological tropopause is the one tropopause which fits in best with surrounding stations or with continuity. Usually this is the highest tropopause at Nandi, Fiji (100-120 mb) and often the lowest one (200-300 mb) at New Zealand stations. *Subject Headings:* 1. Tropopause data 2. Stratospheric temperatures 3. New Zealand.—*M.R.*

6.5-102

551.510.52:621.396

Hay, H. G. and Unwin, R. S., **Extension of the mode theory of tropospheric refraction to cover variations in the refractive index profile along a transmission path.** *Great Britain. Telecommunications Research Establishment, T.R.E. Technical Note* No. 124, Aug. 1951. 13 p. 6 figs., 3 refs., 37 eqs. Mimeo. GB-MO—The method is to divide the transmission path into zones in each of which variations in the profile are small. The duct height and lapse rate of modified refractive index at infinite height are found by the half-power law and used with a set of curves to evaluate the distribution of radio field strength beyond the horizon of the transmitter. *Subject Headings:* 1. Radio wave propagation 2. Radio transmission ducts.—*C.E.P.B.*

6.5-103

551.510.53:551.524.7:536.33

Bauer, Ernest and Wu, Ta-You, **The cooling of a gas by radiation.** *Royal Society of London, Proceedings, Ser. A*, 67(9):741-750, Sept. 1, 1954. 2 figs., 4 refs., 45 eqs. DWB. Also issued as: New York Univ. Institute of Mathematical Sciences, Contract AF 19(122)-463, Research Report, CX-14, April 1954. MH-BH—The cooling of a gas, composed of atoms having two electronic states, by radiation is calculated. The results are applied to a simplified model of the atmosphere at about 100 km (where there are oxygen atoms) and the cooling overnight (in 10 hrs) is calculated as about 30°. *Subject Heading:* 1. Stratospheric temperature.—*C.E.P.B.*

6.5-104

551.510.534

Larsen, S. H. H., **Vertical distribution of atmospheric ozone at Longyearbyen, Spitzbergen (78°N).** *Journal of Atmospheric and Terrestrial Physics*, 6(1):46-49, Jan. 1955. 2 figs.,

4 tables, 3 refs. DWB—Observations with a Dobson spectrophotometer in Sept. 1950 and April 1951 were used to calculate vertical distribution of ozone (0–65 km) with total amounts of 0.190, 0.205 and 0.335 cm. Centers of gravity were 23.4, 22.9 and 21.9 km. Peak ratio O_3 air by volume was $8.8-12.5 \times 10^{-6}$ at 35 km. Results resemble those at Tromsø (70°N). *Subject Headings: 1. Ozone layer 2. Spitzbergen.—C.E.P.B.*

6.5-105

551.510:534:523.38

Letfus, V. (*Astrophysical Obs., Ondrejov, Czecho.*), *Influence de l'ozonosphère sur la densité de l'ombre dans les éclipses de lune.* [Influence of the ozonosphere on the density of the shadow in lunar eclipses.] *Bulletin of the Astronomical Institutes of Czechoslovakia*, Prague, 4/2 :36-44, 1953. 11 figs., 23 refs. In French; Russian summary p. 43-44. DLC—The density of light (or of shadow) in the center of the moon as well as toward the margins during eclipses is influenced by the cloudiness in the troposphere, but much more strongly by the absorption of sunlight by ozone between 10 and 40 km (the ozonosphere). Extensive and careful numerical calculations were made of absorption in 4700, 5300 and 6400 Å regions and of the densities of shadow under different conditions. The marked elliptical shape of the central umbra is thought to be a result of the variations of depth of ozone in the various latitudes of the earth's atmosphere. A possible effect of meteoric dust is suggested. *Subject Headings: 1. Ozone absorption 2. Lunar eclipses 3. Ellipticity of earth's umbra.—M.R.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: Prognostic charts (Kerr), 6.5-70; Surface albedo (Alpert, Houghton), 6.5-140; Water-vapor transfer (Benton, Estoque), 6.5-205.

6.5-106

551.511:551.551

Blackadar, A. K., *Extension of the laws of thermodynamics to turbulent systems.* New York Univ. College of Engineering. Research Div., Contract AF 19(122)-261, Scientific Report, No. 1, Jan. 1954. 29 p. 2 figs., eqs. DWB—The energy equations applicable to the mean state of a turbulent fluid are reviewed, and a concept of the relative flux of turbulent kinetic energy is defined. The applicability of the second law of thermodynamics as formulated by VAN MIEGHEM is discussed. It is shown that such irreversible processes as the decay of mean motion into turbulence, the relative flux of turbulent energy, and eddy diffusion are not governed by the classical laws of thermodynamics but properly belong in the field of eddy thermodynamics proposed by RICHARDSON. It is found that there exists an eddy analogue of the entropy which is a function of the eddy energy and partial densities of the various constituents of a fluid which observations suggest is consistently created by irreversible phenomena of turbulence. This property of eddy entropy is incorporated into a statement which is called the second law of eddy thermodynamics. *Subject Headings: 1. Eddy thermodynamics 2. Entropy 3. Atmospheric turbulence.—Author's abstract.*

6.5-107

551.511:551.551

De Pasquale, Oreste, *Ricerche sperimentali sulla turbolenza atmosferica; la turbolenza atmosferica e le variazioni della pressione barometrica.* [Experimental research on atmospheric turbulence; atmospheric turbulence and the variation of barometric pressure.] *Rivista di Meteorologia Aeronautica*, 14(1):3-20, Jan./March 1954. 6 figs., 29 refs. Italian, French, English and German summaries p. 3. MH-BH—On the basis of the theory of elastic waves of the acoustic type the author shows that most elementary actions which give rise to turbulence are transferred into periodic basic variations and suggests that a fourth term representing the total dynamical effect should be added to the barometric tendency equation. In addition a detailed description with the aid of diagrams is given of microbarometric apparatus (pressure turbographs) for setting up a microbarometric signalling service for synoptic use and recording in compliance with the international code 05. *Subject Headings: 1. Atmospheric turbulence 2. Turbulent pressure fluctuations 3. Turbographs.—Based on author's abstract.*

6.5-108

551.511:533.6

Doporto, M., **The cellular solution of the dynamical equations and the actual perturbation of the westerlies up to 16 km at Valentia.** *Tellus*, 6(1):32-43, Feb. 1954. 4 figs., 6 tables, 14 refs., eqs. **MH-BH**—The cellular solution of the linearized hydrodynamical equations requires the existence of nodal surfaces for the perturbation of air density, pressure and velocity components. When a constant, which appears in the formulas giving heights of the nodal surfaces, is determined from the observed value of one of them, namely, the first nodal surface of the vertical velocity, all the other heights of nodal surfaces agree within reasonable limits with the heights determined from actual observations by several investigators using very different methods. More than 400 upper wind ascents reaching at least 16 km made by radio wind or radar methods at Valentia Observatory, have been classified according to the sign of the change of pressure at 8 km during the 12 hours prior to the ascent, and average values of the meridional and zonal components of the wind computed. The difference at each level between the corresponding average components of the wind when the pressure has increased and when the pressure has decreased gives a good approximation to double the value of the horizontal perturbation of the westerlies. Applied to this case, the cellular solution requires that the zonal component of the perturbation so determined should be zero at all levels while the meridional component should have nodal surfaces at 4 and 12 km. The observations show that the zonal component is the one having nodal surfaces at the required levels while the meridional component has a maximum value at about 9 km. Taking into account that the equations refer to a single-layer atmosphere and neglect the meridional gradient of temperature, the disagreement between observation and theory appears to be less significant than the confirmation of the existence of nodal surfaces which cannot be explained by the generally accepted exponential solution of the dynamical equations. *Subject Headings:* 1. Dynamics of the atmosphere 2. Equations of motion 3. Atmospheric circulation theory 4. Valentia, Ireland.—*Author's abstract.*

6.5-109

551.511

Fultz, D.; Nakagawa, Y. and Frenzen, P. (*Hydrodynamics Lab., Chicago Univ.*), **An instability in thermal convection of Eddington's "overstability."** *Physical Review*, 94(6):1471-1472, June 15, 1954. refs. **DWB**—The existence of modes of cellular convection driven by thermal instability which are oscillatory in type, rather than steady, has been predicted theoretically for systems that are rotating as a whole. Such modes are of a type called "overstable" by EDDINGTON in a different connection. The result of an initial successful experiment with mercury is given. *Subject Heading:* 1. Convective cells.—*Authors' abstract.*

6.5-110

551.511

McIntyre, D. P. (*Res. and Training Services, Met. Div., Toronto, Canada*), **Energy and instability in the atmosphere.** *Royal Meteorological Society, Canadian Branch, [Publications]* (6), 1952. 11 p. 10 figs., refs. **DWB**—Shows the advantages of the energy approach to atmospheric instability. The specific enthalpy as the total of internal energy and expansion work against pressure forces is considered as the thermodynamic potential of the atmospheric engine. A number of examples show how to utilize the tephigram for the computation of enthalpy changes especially in cases considered by MARGULES and by NORMAND. It has to be remembered, however, that this analysis does not permit full hydrodynamic freedom so that an additional theoretical development shows what dynamic terms, including solenoids, have to be added. *Subject Headings:* 1. Instability 2. Enthalpy 3. Tephigrams.—*A.A.*

6.5-111

551.511

Moran, Francisco, **Los problemas planos de la meteorología por el método de los complejos bidimensionales.** [Plane meteorological field problems solved by a method of two-dimensional complex numbers.] *Revista de Geofísica*, 11(41):18-60, Jan./March, 1952. 1 figs., 190 eqs. Spanish and German summaries p. 18. **DWB**—A method for the treatment of plane vector fields by complex numbers is discussed which conserves the advantages of the usual vector analysis. The planetary atmospheric movements are discussed and special attention is paid to the general horizontal movement of the air including divergence, isobaric

navigation, geostrophic disturbances, inertia trajectories, effects of gradient variations, change of the geostrophic wind with height, considering also the effect of friction in general, and on circular cyclones in particular. The paper concludes with chapters on the energy dissipation in a turbulent boundary layer and on the effect of exchange on curvilinear isobars. *Subject Headings*: 1. Dynamics of the atmosphere 2. General circulation 3. Atmospheric turbulence. —A.A.

6.5-112

551.511

Sherman, Leon, **On periodic barotropic flow patterns whose mean flow velocity profile is initially sinusoidal.** California. Univ. at L. A. Dept. of Meteorology, Contract AF 19(604)-728, Scientific Report, No. 2, May 1954. 18 p. 3 figs., 2 tables, 6 refs., eqs. MH-BH—This paper considers the doubly two-dimensional flow of a homogeneous inviscid fluid. Such a flow is characterized by a stream function. We consider a model which at the initial time consists of a disturbance, whose stream function varies sinusoidally along each coordinate direction, added to a flow parallel to one of the coordinate directions, whose speed profile is sinusoidal. This initial flow pattern has trough and ridge lines normal to the direction of the zonal flow. The initial tilting of these patterns and the flow of kinetic energy between disturbance and zonal current are considered. Then a procedure for the numerical integration of non-steady cases is set up and the errors involved are estimated. As a byproduct a simple means of eliminating an error of the order of 5 to 7% from numerical forecasting procedures is pointed out. *Subject Headings*: 1. Barotropic theory 2. Equations of motion 3. Dynamics of the atmosphere 4. Numerical forecasting.—*Author's abstract.*

6.5-113

551.511

Sherman, Leon and Cressman, George P., **On the computation of horizontal divergence.** *Journal of Meteorology*, 12(1):90-91, Feb. 1955. 3 refs., 6 eqs. DWB—Sherman comments on 2 assumptions by Cressman: **An approximate method of divergence measurement**, *Ibid.*, 11:83-90, 1954 (see item 5.8-103, Aug. 1954, MAB). Cressman replies. *Subject Heading*: 1. Divergence.—C.E.P.B.

6.5-114

551.511:551.573

Tverskaia, N. P., **Teplootdacha i isparenie kapli v potoke.** [Heat emission and evaporation of a drop in a current.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofizicheskaiia*, No. 3:259-263, 1953. fig., 2 tables, 7 refs., 4 eqs. DLC—Results of an experimental determination of MUSSELT's criterion of diffusion and heat with small Reynolds numbers ($Re < 30$) are presented. Relationship of these criteria with those of REYNOLDS and PRANDTL is established. The author maintains that some theoretical results, obtained by solution of equations pertaining to the evaporation of a spherical drop in a gas current can be used for calculation of the emission of heat from a globe in a moving medium. *Subject Headings*: 1. Evaporation of water drops 2. Heat diffusion.—N.T.Z.

GENERAL CIRCULATION

See also: Jet stream (Riehl, others), 6.5-1.

6.5-115

551.513:551.46

*Farkas, Edith and Hutchings, J. S., **Modifications undergone by surface air currents in passing from Macquarie Island to Southern New Zealand.** *New Zealand. Meteorological Service, Technical Note*, No. 104, Dec. 9, 1953. 3 p. 3 tables, 5 refs. DWB—Synoptic data for the year 1951 have been examined and 28 cases have been obtained in which surface air passing the vicinity of Macquarie Island (54°S) could with reasonable certainty be traced to the southern part of New Zealand. The modifications in surface temperature and dew-point undergone by the air have been investigated and an attempt has been made to relate these changes to the temperature of the underlying sea surface and to the length of time the air is over the sea. *Subject Headings*: 1. Air mass modification 2. Ocean-atmosphere interaction 3. Air flow over oceans 4. Macquarie Island 5. New Zealand.—*Authors' abstract.*

6.5-116

551.513:551.557

Fleagle, Robert G. and Endlich, Roy M., Comments on "A study of vertical velocities in the vicinity of jet streams." *Journal of Meteorology*, 11(6):513-514, Dec. 1954. figs., 3 refs. DWB—Commenting on paper by ENDLICH (*Ibid.*, 10:407-415, 1953, see item 5.6-117, June 1954, MAB) FLEAGLE criticizes use of 12-hr horizontal advection term in measuring vertical velocities. ENDLICH replies that use of 3-hr change gives comparable results. *Subject Headings: 1. Jet stream.—C.E.P.B.*

6.5-117

551.513

Massachusetts Institute of Technology, **Extended forecasting project.** Contract Cwb-8373, Progress Report, July 1-Dec. 31, 1953. Jan. 1, 1954. 22 p. Typescript. DWB—Project report consists of brief review of attempts at analysis of current (1949-50) synoptic weather data for both Northern and Southern Hemispheres (routine reading, computation and plotting of 5-day mean data from Northern and Southern Hemispheres sea level and Northern Hemisphere 500 mb maps through Sept. 1950), profiles, circulation indices, correlation coefficients, interhemispherical pressure relationships, and study of day-to-day and week-to-week responses of general circulation of current solar variations by use of data from Harvard High Altitude Observatory at Boulder, Colo., and similar comparison of variations for selected period 1899-1939. (For final report, July 1952-June 1953, see item 5.9-82, Sept. 1954, MAB.) *Subject Headings: 1. General circulation studies 2. Solar effects on general circulation 3. Southern Hemisphere Project (South Africa). I. Willet, Hurd C.—M.R.*

6.5-118

551.513

*Rubin, Morton J., **Investigation of relationships between Northern and Southern Hemisphere meteorological parameters.** Weather Services, Inc., Boston, Contract AF 19(604)-449, Scientific Report, No. 4, [1954?] 12 p. 8 tables. MH-BH—A variety of circulation indices and regional indices are utilized to measure the degree of interrelation between the Northern and Southern Hemisphere circulation. The lack of a complete network of stations makes difficult the determination of the existence of the interrelation. Some evidence exists, however, that the Southern Hemisphere circulation may influence the Northern Hemisphere in July. It is also suggested that the Northern Hemisphere circulation may act upon the Southern Hemisphere in January. *Subject Headings: 1. General circulation 2. Northern and Southern Hemisphere relationships 3. Northern Hemisphere 4. Southern Hemisphere.—Author's abstract.*

6.5-119

551.513.1

Krueger, Arthur F. (*Extended Forecast Section, U. S. W. B., Wash., D. C.*), **The weather and circulation of January 1954. A low index month with a pronounced blocking wave.** *Monthly Weather Review*, 82(1):29-34, Jan. 1954. 8 figs., 7 refs. MH-BH—Blocking in the Bering Sea and North Atlantic during a considerable portion of Jan. 1954 resulted in great storminess, cold NW winds and low 700 mb isobaric surfaces over the Pacific Northwest and Central and Southern Europe, respectively. Other abnormal features of the month's weather (such as a persistent deep low in Okhotsk Sea) in the Northern Hemisphere are described and illustrated on graphs and charts. *Subject Headings: 1. Blocking action 2. General circulation 3. Zonal index 4. Northern Hemisphere.—M.R.*

6.5-120

551.513.1

Van Mieghem, J., **Note on energy transfer and conversion in large atmospheric disturbances.** *Royal Meteorological Society, Quarterly Journal*, 81(347):18-22, Jan. 1955. 6 refs., 6 eqs. DWB—Referring to the paper by R. FJORTOFT in *Compendium of Meteorology* (see item 3.8-3, Aug. 1952, MAB), VAN MIEGHEM shows that the necessity of baroclinicity for the development and maintenance of large disturbances can be derived from the perturbation theory. During their growth, potential energy is converted into kinetic and entropy is generated. *Subject Headings: 1. General circulation 2. Perturbation theory.—C.E.P.B.*

6.5-121

551.513.2:551.557

Endlich, R. M.; Harney, Patrick; McLean, G. C. and others, (*GRD, AF Cambridge Research Center, Cambridge, Mass.*), **Project Jet Stream. The observation and analysis of**

the detailed structure of the atmosphere near the tropopause. *American Meteorological Society, Bulletin*, 35(4):143-153, April 1954. 10 figs., table, 9 refs. **MH-BH**—Results of a micro-analysis of winds at the 200-300 mb level over the Southeastern States (mostly Florida) are shown on constant pressure charts for those levels (around 30 and 40 thousand feet). The observations were made from an Air Force B-47 jet bomber (and a B-29 for observation near 400 mb level). Wind was measured every 20 miles, showing a considerable variation in wind maxima between ordinary weather reporting stations, indicating that a dense network of upper air wind stations would be needed to identify the detected structure of the jet stream on synoptic charts. Temperature, cloud, contrail, turbulence and humidity data were also obtained on these flights—either from continuous records or frequent observations. Gradient winds were found to be more accurate than geostrophic winds. *Subject Headings*: 1. Jet stream microstructure 2. Upper air winds 3. Project Jet Stream 4. Florida. I. Rados, Robert M. II. Tibbets, O. J. III. Widger, W. K., Jr.—*M.R.*

6.5-122

551.513.2:551.557

Klein, William H. (*Extended Forecast Sec., U. S. W. B., Wash., D. C.*), **The weather and circulation of April 1954. A month with a confluent jet stream.** *Monthly Weather Review*, 82(4):104-109, April 1954. 9 figs., 11 refs. **MH-BH**—The notable feature of the April 1954 weather pattern was the excessively strong meridional temperature gradient from lat. 40° to 60°N across the North American continent from 160°W to mid Atlantic (40°W). This was a result of very cold air pools centered in NE British Columbia and Labrador, and abnormal warm air (due to strong westerlies which isolated the cold air in Canada) across the U. S. as a result the jet stream coincided with the polar front on mean charts for April while the tropical jet normally found over southern U. S. at 200 mb was fragmentary and weak. This is the first monthly mean chart since July 1952 when this anomaly was noted; tracks of cyclones and anticyclones, mean position of polar front, zonal wind speed profiles and a surface synoptic chart for April 6, 1954 showing typical conditions such as prevailed in April are presented. *Subject Headings*: 1. Jet stream anomalies 2. Thickness anomalies 3. North America.—*M.R.*

6.5-123

551.513.2:551.557:551.501.7

Riehl, Herbert, Berry, F. A. and Maynard H., **Exploration of the jet stream by aircraft during the 1952-1953 winter.** *Journal of Meteorology*, 12(1):26-35, Feb. 1955. 14 figs., table, 8 refs., 6 eqs. **DWB**—In winter 1952/53 24 flights were made at 300 mb across jet stream over eastern U. S. Evaluation is described. Flight of 27 Feb. is given as an example, with wind profile (240 knots at peak), 500 mb isotherms and 300 and 200 mb contours. Five flights gave winds consistent enough for detailed discussion. Observed and gradient winds agreed well. All speed profiles suggested peaks rather than rounded maxima. Vorticity profiles show a discontinuity at jet axis; vorticity is zero within 150 km to right and positive at $0.3-0.4 \times 10^{-4} \text{ sec}^{-1}$ beyond 150 km. On left of axis it is much higher and proportional to wind speed. Distribution of turbulence is summarized. *Subject Headings*: 1. Airplane weather reconnaissance 2. Jet stream.—*C.E.P.B.*

ATMOSPHERIC DISTURBANCES

See also: Radar detection of tornadoes (Marshall), 6.5-43; To track tornadoes, 6.5-44; Met. observ. for weather forecasting (Schwerdtfeger), 6.5-64; Typhoon forecast (Takahashi), 6.5-68; Forecasting of cyclone (Petterssen, others), 6.5-72; High level flight (Creswick), 6.5-79; Air mass transformation (Laikman, Iudin), 6.5-155; Barometer antics (Bhalotra), 6.5-172; Cyclone damage (Poey), 6.5-191; Coronas (Piskovskaia-Fesenkova), 6.5-329; Thunderstorm electricity (Mason), 6.5-356.

6.5-124

551.515.11

Petterssen, Sverre, **A general survey of factors influencing development at sea level.** *Journal of Meteorology*, 12(1):36-42, Feb. 1955. 2 figs., table, 7 refs., 7 eqs. **DWB**—SUTCLIFFE's theory of development is reviewed and extended, with particular reference to cyclonic development at sea level. It is shown that cyclogenesis results from an unbalance, in the layer below the level of non-divergence, of the vorticity advection and the Laplacian of certain

thermal quantities. It is suggested that cyclogenesis results not from the release of an infinitesimal perturbation by a dynamically unstable state, but rather from the release of some kind of instability by finite perturbations which can be identified with the wave-shaped motion patterns in the middle and upper troposphere. *Subject Headings: 1. Cyclogenesis 2. Sutcliffe's development theory.—Author's abstract.*

6.5-125

551.515.11:551.555.6

Ramaswamy, C. and Bose, B. L. (*Airport, Calcutta*), On certain new aspects of the thermal patterns associated with Nor'westers over Northeast India and Eastern Pakistan. *Current Science*, 23(3):75-77, March 1954. DWB—A continuation of studies reported in previous papers (*see item 5.8-114*, Aug. 1954, *MAB*), giving an analysis of the importance of high level cold air advection from the NW in producing the intense storms known as Northwesters over West Bengal and East Pakistan. The point is illustrated by means of thermal wind and thickness charts for 700 to 500 and 500 to 300 mb levels. The warm moist air is, of course, necessary to provide the moisture, but it is there most of the time anyway. It is only when cold (thin) pools or currents come over the moist layers, giving steep lapse rates, that the thunderqualls are "triggered." *Subject Headings: 1. Northwesters 2. Thunder squalls 3. Thickness charts 4. Cold air advection aloft 5. Bengal 6. Pakistan.—M.R.*

6.5-126

551.515.11:551.583.13

Vitel's, L. A., *Kalendarnye osobennosti v kolebaniikh intensivnosti islandskikh i severoevropeiskikh tsiklonov*. [Singularities in intensity fluctuations of Icelandic and north European cyclones.] *Akademiia Nauk SSSR, Izvestiia, Seriya Geofizicheskaiia*, No. 4:97-102, 1952. 4 figs., 5 refs. Hungarian transl. by Sándor Gelléri, in *Időjárás*, 56:(7/8):222-225, July/Aug. 1952. DLC—A statistical investigation of cyclonic indexes for the North Atlantic and Northeast Europe made for 40 years (Feb. and Aug.) showed fairly well expressed singularity variations with an average length of 10-11 days. The simultaneous variations in the two regions have an inverse course, explained by the theory of thermobaric seiches (V. V. SHULEIKIN). *Subject Headings: 1. Singularities 2. Cyclone intensities 3. North Atlantic 4. Northeast Europe 5. Translations. I. Gelléri, Sándor (trans.).—A.A.*

6.5-127

551.515.127:551.547:551.509.317

Smith, C. V. and Forsdyke, A. G., Some downstream effects associated with large-amplitude troughs in upper flow patterns. *Royal Meteorological Society, Quarterly Journal*, 79(341):414-417, July 1953. 4 tables. DWB—A large-amplitude trough at 500 mb over America is associated with or followed by a large amplitude trough downstream on only one occasion in three. When the American trough is persistent and simple, there is much greater probability of a large downstream trough towards the end of the following 4-day interval. For similar article *see item 4.6-67*, June 1953, *MAB*.) *Subject Headings: 1. Synoptic aerological studies 2. Upper level troughs.—C.E.P.B.*

6.5-128

551.515.13

Hoyle, H. D., An investigation into the speed and direction of motion of simple warm sector depressions. *Great Britain. Meteorological Research Committee, M.R.P.* No. 872, Aug. 9, 1954. 4 p. fig., 2 tables, 3 refs. Mimeo. DWB—Motion in 12 hours of 16 unoccluded depressions over Atlantic Jan.-June 1951 was compared with contour winds and 1000-500 mb thermal wind over an area (diameter 600 naut. mi.) round the center.

Wind at (mb)	1000	700	500	300	Warm sector wind	1000-500 mb
Corr. coeff.	.47	.86	.90	.89	.81	.92
Mean track error°	—	-5.5	-2.9	-4.1	-6.1	-0.6

A check on 18 cases in 1950 gave a correlation of .94 with thermal wind. Marked influence ahead of surface center increased speed. *Subject Heading: 1. Cyclone steering.—C.E.P.B.*

6.5-129

551.515.21(52)

Arakawa, Hidetoshi, Analysis of the typhoon Kitty by means of serial ascents. *Japan. Central Meteorological Observatory, Tokyo, Memoirs*, 35(3):289-294, 1950. 3 figs., table, 8 refs.,

eq. In Japanese; English summary p. (9). DWB—During the typhoon "Kitty" (Aug. 31 1949) swarm ascents were made, which made possible the construction of a cross section of the typhoon circulation in natural stage of development. Most interesting is the fact that warm air and downward displacements exist in the cyclonic core, and cold air and upward displacements in the storm area. *Subject Headings:* 1. Typhoon structure 2. Typhoon "Kitty" (1949) 3. Japan.—A.A.

6.5-130

551.515.2

Jordan, Charles L. and Jordan, Elizabeth L., *On the mean thermal structure of tropical cyclones*. *Journal of Meteorology*, 11(6):440-448, Dec. 1954. 15 figs., 5 tables, 11 refs. Also issued as: Chicago Univ. Dept. of Meteorology, Contract N6ori-02036, Project N0001-085 003, Reports on Research (unnumbered), March 1954. 13 p. 15 figs., 11 refs. Appendix: Birchfield, G. E., *Ship reports of cloudiness as an aid in low latitude weather analysis* 4 p. 2 figs., 4 refs. DWB—About 300 radiosonde ascents within 6° lat. of centers of mature hurricanes in West Indian area for period 1946-52 give mean temperatures at levels up to 50 mb, tropopause structure, surface pressure and heights of standard isobars. At 200 mb there is an anticyclonic ring around a cyclonic core. Geostrophic components along and across direction of motion give a resultant to right of track at low levels and to left at high levels. Tropopause is higher and colder towards center. Vertical circulation is shown schematically. The W. I. hurricane of Sept. 4-7, 1953, and the large Okinawa typhoon of Aug. 16-19, 1951, show features consistent with, though more marked than, the mean values. *Subject Headings:* 1. Hurricane structure 2. Typhoon structure 3. Hurricane tropopause 4. West Indies. I. Riehl, Herbert.—C.E.P.B.

6.5-131

551.515.4

Arabadzhi, V. I., *Geograficheskie osobennosti groz*. [Geographic characteristics of thunderstorms.] *Priroda*, Moscow, 43(7):96-99, July 1954. 2 figs. DLC—Data are given on the annual frequency of thunderstorms in representative parts of the world and maps showing the world-wide distribution of thunderstorms (C. E. P. BROOKS) and in the U.S.S.R. are given. The relationship between thunderstorm frequency and relief, the frequency of thunderstorms in interior of continents and the daily variation of thunderstorms are discussed. *Subject Headings:* 1. Thunderstorm frequencies 2. Global thunderstorm distribution 3. U.S.S.R.—I.L.D.

6.5-132

551.515.4(494)

*Bouët, Max, *L'orage à Lausanne*. [Thunderstorms at Lausanne.] *Société Vaudoise des Sciences Naturelles, Bulletin*, 65(285):495-500, Dec. 31, 1953. 3 refs. DWB—The average monthly number of thunderstorm days at Lausanne (Champ de l'Air) according to records for all except 7 years from 1888-1952 (58 years) is as follows: (Jan.-Dec., respectively) 0.0, 0.2, 0.3, 1.3, 3.9, 5.2, 5.2, 4.3, 2.2, 0.4, 0.2, 0.1 with annual average of 23.3 and a total of 1306 days (when thunder was heard). The months of June and July show the greatest frequency. The actual average annual frequency is estimated to be more nearly 32.2 since the records for thunderstorms in the vicinity for 9 of the 58 years, show a ratio of 1.5 to 1 as compared with those recorded at Champ de l'Air Observatory in the city, when noise would often drown out the sound of thunder. Hourly frequencies are also tabulated (9% during each hour from 16-22 h). Ninety-two percent of the storms come from azimuth from South to West. *Subject Headings:* 1. Thunderstorm frequency data 2. Diurnal thunderstorm frequencies 3. Lausanne, Switzerland.—M.R.

6.5-133

551.515.42:551.577

Ambrosetti, Fl. (*Central Met. Obs., Locarno-Monti*), *Temporal e precipitazioni temporalesche al margine meridionale dell Alpi*. [Thunderstorms and thunderstorm precipitation at the southern boundaries of the Alps.] *Geofisica Pura e Applicata*, 28:261-272, 1954. figs., 7 tables, 14 refs., eq. Italian and German summaries p. 261. MH-BH—Eight stations which lie approximately on the line between Milan and Zurich calculated average number of successive days with thunderstorms for period 1936-1950. The total amount of precipitation for such thunderstorm days was calculated at Locarno-Monti station (1936-1953) and

classified as to frontal, "Südstau," or local for period 1949–1953 from April to Sept. Finally, rainfalls which occurred on days under investigation but from different types of thunderstorms are discussed. *Subject Headings:* 1. Thunderstorm frequencies 2. Thunderstorm rainfall 3. Switzerland 4. Northern Italy 5. Alps.—*Transl. of German summary.*

6.5–134

551.515.7

Hoddinott, M. H. O., **Anticyclones.** *Weather*, 10(1):29, Jan. 1955. DWB—Speculative letter on causes of origin and changes of anticyclones. *Subject Heading:* 1. Anticyclones.—*C.E.P.B.*

6.5–135

551.515.8:551.577

†Oliver, Vincent J. and Holzworth, George C., **Some effects of the evaporation of widespread precipitation on the production of fronts and on changes in frontal slopes and motions.** *Monthly Weather Review*, 81(5):141–151, May 1953. 27 figs., 7 refs. MH-BH—Thunderstorm precipitation falling from the warm air over a cold front into the cold, excessively dry air below rapidly cools this air even more by evaporation of the raindrops. This changes the pressure distribution and requires a new adjustment of the frontal slope. Sample cases are discussed in detail utilizing surface and 850 mb charts, air soundings, cross sections, and synoptic precipitation charts (*see also* paper by H. Wexler, *item* 6.5–136). *Subject Headings:* 1. Fronts 2. Evaporation of raindrops 3. Pressure jump 4. United States.—*A.A.*

6.5–136

551.515.8:551.577

Wexler, Harry (U. S. W. B., Wash., D. C.), **Readjustment of a front after cooling by precipitation.** *Monthly Weather Review*, 81(5):152–154, May 1953. 2 figs., table, 2 refs. MH-BH—A theoretical discussion in connection with a synoptic study made by OLIVER and HOLZWORTH (*see* 6.5–135). The readjustment of the front is analyzed by means of Margules' formula, computing the frontal displacements. Very interesting frontal oscillations, damped by friction and sometimes reintensified by new surges of the rain-cooled air, are observed. The liberation of kinetic energy by the readjustment process is computed. *Subject Headings:* 1. Frontal displacements 2. Margules' formula 3. Kinetic energy 4. Precipitation effects.—*A.A.*

6.5–137

551.515.8:551.509.311

Penner, C. M., **A three-front model for synoptic analyses.** *Royal Meteorological Society, Quarterly Journal*, 81(347):89–91, Jan. 1955. 4 figs., table, 4 refs. DWB—In N. America in winter mT , mP , mA and cA air masses are separated by polar, maritime arctic and continental arctic fronts. A cyclone model including three air masses is compared with the classical two-mass model. Most of the major cyclones in Canada result from in-phase wave development in three (sometimes four) air masses. *Subject Headings:* 1. Frontal structure 2. Synoptic analysis.—*C.E.P.B.*

6.5–138

551.515.8:551.578.41

§Wexler, Raymond; Reed, R. J. and Honig, J. (*Dept. of Met., M.I.T., Cambridge*), **Atmospheric cooling by melting snow.** *American Meteorological Society, Bulletin*, 35(2):48–51, Feb. 1954. 5 figs., table, 3 refs. MH-BH—A study of the theory of cooling of air through which snow is falling and the consequences with respect to stability and condensation, with synoptic examples from the snow storm of April 13, 1953 (which gave 8" snow in outlying suburbs of Boston). RHI photographs from Cambridge, Mass., show that the "bright band" lowered from 6000 ft at 1805 EST to 2000 ft at 1958 EST and later to the ground level. This lowering of the freezing (0°C) level cannot be accounted for by advection, since warm air was being advected into the area, but is more likely due to the cooling by falling rain, plus the enormous amount of heat absorbed in melting the falling snow. *Subject Headings:* 1. Cooling of air by falling snow 2. Snow temperature 3. Boston, Mass.—*M.R.*

6.5–139

551.515.83

Newton, C. W., **Frontogenesis and frontolysis as a three-dimensional process.** *Journal of Meteorology*, 11(6):449–461, Dec. 1954. 14 figs., 2 tables, 18 refs., eqs. DWB—The

structure of a deep upper trough over N. America on April 3, 1950, is studied by charts and cross sections including jet stream. In the west a well marked west-east frontal layer extends through the troposphere, but eastwards it disappears in upper levels. Changes in vorticity, vertical shear, and horizontal temperature gradient as air passes eastwards are analyzed. Frontolysis in middle troposphere is due mainly to horizontal gradients of vertical motion and vertical gradients of the non-geostrophic wind component normal to the front. Near the maximum wind level and near earth's surface divergence processes and deformation fields in the horizontal flow predominate. Generalized 3-dimensional circulations in the delta region are constructed. *Subject Headings:* 1. Frontogenesis 2. Frontolysis 3. Jet stream.—*C.E.P.B.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Radiation flux meters** (MacDowall), 6.5-54; **Condensation nuclei** (Mrose), 6.5-219; **Britain's sunshine** (Manley), 6.5-271; **Visibility in fog** (Koomen, Dunkelmann), 6.5-317; **Infrared refraction** (Rank, Shearer), 6.5-321.

6.5-140

551.521:551.511

Alpert, Leo and Houghton, Henry G., **Latitudinal variation of the surface albedo.** *Journal of Meteorology*, 11(6):516-517, Dec. 1954. Also: Benton, George S. and Houghton, Henry G., **Comments on the annual heat balance of the Northern Hemisphere.** *Ibid.*, 11(6):517-518, Dec. 1954. 2 figs., table, 4 refs. DWB—Referring to HOUGHTON's paper **On the annual heat balance of the Northern Hemisphere** (see item 5.7-81, July 1954, *MAB*), ALPERT criticizes values used for albedo of various surfaces. HOUGHTON accepts criticism but considers that they do not affect results significantly. BENTON compares HOUGHTON's results in the same paper with those of G. C. SIMPSON (1929) and finds good agreement, but HOUGHTON thinks this is accidental. *Subject Headings:* 1. Heat balance 2. Radiation balance. I. Simpson, G. C.—*C.E.P.B.*

6.5-141

551.521.1:551.510.534 523.74:550.38

Adel, Arthur (*Arizona State College, Flagstaff*), **The solar-terrestrial parameter "Effective radiation temperature of the ozone region" and evidence for solar variability with a period of ten weeks.** *American Meteorological Society, Bulletin*, 35(8):376-377, Oct. 1954. 5 refs. MH-BH—Evidence is presented to show the existence of a solar-terrestrial relationship involving the effective radiation temperature of the ozone region. It includes the existence of a good correlation between abrupt changes in the effective radiation temperature of the ozone region (ERTOR) and coronal and disk excitation of the sun and the fact that the annual trend of ERTOR depends upon solar radiation since its maximum and minimum keep step with the summer and winter respectively. *Subject Headings:* 1. Solar-terrestrial relationships 2. Effective radiation 3. Ozonosphere temperatures 4. Ozone layer.—*I.L.D.*

6.5-142

551.521.1:551.501

Riblet, Jean, **Bilan calorifique de l'énergie effectivement versée par le rayonnement solaire direct en un lieu donné.** [Thermal energy balance of direct solar radiation received at a given place.] *Annales de Géophysique*, 10(2):157-158, April/June 1954. 3 figs., 2 refs. DWB—A simple method is proposed for computing direct solar radiation received at a given place. The computation accounts for the following elements: 1) reduction of daily insolation by obstacles near the site (for every day of the year) as determined by a stereographic projection device developed by the author, 2) average sunshine duration for every day of the year and 3) amount of heat energy of solar radiation received on a surface of unit area normal to the sun's rays. *Subject Headings:* 1. Heat balance 2. Solar radiation computations.—*G.T.*

6.5-143

551.521.1:621.47

Telkes, Maria (*New York Univ., N. Y.*), **Solar thermoelectric generators.** *Journal of Applied Physics*, 25(6):765-777, June 1954. 7 figs., 8 tables, 60 refs. DLC—The physical

characteristics, thermoelectric power, resistivity, specific heat conductivity, and the temperature difference between hot and cold junctions determine the efficiency of thermocouple materials. These data have been determined for Chromel *P*-constantan, bismuth alloys, and the intermetallic compound ZnSb, containing small amounts of added metals. The optimum characteristics of flat-plate type solar energy collectors have been evaluated in combination with thermocouples, designed for maximum energy conversion. Using flat-plate collectors with 2 glass panes, an efficiency of 0.63 percent was obtained with the ZnSb-type alloys in combination with a negative Bi-alloy. The commercially available ductile alloys Chromel *P*-constantan, produced ten times lower efficiency. Calculations indicate that the efficiency may be increased to 1.05 percent by using 4 panes of low-reflection characteristics. With solar energy concentrating means (lenses), the efficiency was increased to 3.35 percent, using the above mentioned best alloy combination. The maximum allowable cost of thermoelectric generators has been evaluated by comparison with present methods of electric power generation. Solar thermoelectric generators may find useful application to the tropics, as they do not contain moving parts and require very little attention. Further development is needed to determine their economical value. *Subject Headings: 1. Solar energy utilization 2. Solar thermoelectric generators.*—*Author's abstract.*

6.5-144

551.521.11

Hamon, Russel W.; Weiss, Leonard L. and Wilson, Walter T., *Insolation as an empirical function of daily sunshine duration*. *Monthly Weather Review*, 82(6):141-146, June 1954. 6 figs., 13 refs., 3 eqs. **MH-BH**—Empirical relations between incident solar radiation received at the earth's surface and (1) percent of possible sunshine, (2) latitude, and (3) time of year are developed. These relations are combined into a graphical method for converting percent of possible sunshine into daily values of incident solar radiation for stations between latitudes 25°N and 50°N. The method is tested on independent data from widely separated locations and a correlation coefficient of 0.97 between estimated and observed values is obtained. *Subject Headings: 1. Possible sunshine duration 2. Insolation.*—*Authors' abstract.*

6.5-145

551.521.13

Johnson, Francis S., *The solar constant*. *Journal of Meteorology*, 11(6):431-439, Dec. 1954. 4 figs., table, 29 refs. **DWB**—New measurements in UV and infrared ends of solar spectrum and new scale corrections give solar constant as $2.00 \text{ cal./cm}^2\text{./min}^{-1} \pm 2\%$. Recent improved data are used to revise Smithsonian zero air-mass corrections, giving absolute values for wave-lengths $0.22\text{--}7.0\mu$. Magnitudes of errors are estimated. Solar illuminance constant is estimated as $13.67 \text{ lumens cm}^{-2}$. *Subject Heading: 1. Solar constant.*—*C.E.P.B.*

6.5-146

551.521.31:551.593.53

*Möller, F.; de Bary, E. and Krog, G., *Die Farbe des Himmels, II*. [The color of the sky, Pt. 2.] *Geofisica Pura e Applicata*, 26:141-152, 1953. 6 figs., 5 tables, 8 refs. German, English and French summaries p. 141. **DWB**—In this section the author applies the formulas derived in Pt. I (see item 4.11-5, Nov. 1953, *MAB*) to compute color, spectral saturation and spectral brightness of the whole sky for different solar angles. From these data the secondary scattering at $Z=60^\circ$ (30° solar altitude) is calculated assuming an earth albedo of 20%. Effect of various power and size distributions (β) of aerosols with uniform turbidity factor $T_{550} = 3.3$. It is stated that WIENER's method of calculating multiple scattering gives erroneous values because in some parts of the sky the ratio of secondary to primary scattering is >1 . Also the color and saturation are constant in the horizontal circle through the sun and only the brightness varies if the turbidity is either very high or very low. *Subject Headings: 1. Sky brightness 2. Sky light color 3. Secondary scattering.*—*M.R.*

6.5-147

551.521.32:523.7

Peyturaux, R. (*Astrophysical Inst., Paris*), *Contributions à l'étude du fond continu du spectre solaire dans le proche infra-rouge*. [Contribution to the study of the continuous background of the solar spectrum in the near infrared.] *Annales d'Astrophysique*, 15(3):302-351, 1952. 30 figs., 12 tables, 19 refs., 31 eqs. **MH-BH**—A substantial study in solar physics. The absorption in the solar photosphere between $6\text{--}12.10^3 \text{ Å}$ was studied, measuring the emitted

energy in different points of the solar disk. The equipment used for the measurement of the darkening from the center to the margin of the disk is described. Results in the center agreed very well with ABBOT's measurements, published in 1913, but disagreed with his paper of 1922 up to 25%. The ion H^- was found to be practically the only absorbant in the solar photosphere between 6 and $23.10^8 \text{ \AA}$. The solar pressure versus temperature is shown and the electronic pressure is computed. Due consideration is given to the atmospheric absorption. *Subject Headings: 1. Solar physics 2. Photospheric absorption 3. Atmospheric absorption.*—A.A.

6.5-148

551.521.32

Plass, G. N. and Fivel, D. I., **The influence of variable mixing ratio and temperature on the radiation flux.** *Royal Meteorological Society, Quarterly Journal*, 81(347):48-62, Jan. 1955. 3 figs., 11 refs., 50 eqs. DWB—A rapidly convergent solution is obtained for the equations of radiative transfer. An absorbing atmosphere having an arbitrary variation of mixing ratio, temperature and pressure with height is considered. The Lorentz shape of the spectral lines together with the dependence of their line strengths and half-widths on pressure and temperature are taken into account in the calculations. It is assumed that the lines do not overlap and the range of validity of this approximation is stated. It is shown that the expression for the absorption of radiation over a path between any two heights can be written in a tractable form even after three-fold integration over the variable conditions along the path, over frequency and over all angles in the hemisphere. When the mass per unit area, along the path, is small or the line intensity is small or both, thus causing the absorption of radiation to be small even at the centre of the line, the integrated absorption is proportional to the dimensionless constant gamma that occurs in atmospheric radiation problems; when these quantities are large, thus causing the absorption to be complete for several half-widths from the centre of the line, the integrated absorption is proportional to the square-root of gamma. This is the generalization to variable path conditions of the linear and square-root relations of infra-red spectroscopy. Some examples of the method developed here are given when the variable conditions along the atmospheric path can be represented with sufficient accuracy as polynomials. An approximation to the H_2O and CO_2 distributions shows that the absorption of radiation from the ground at a given height depends greatly on the variation of the mixing ratio with height. *Subject Heading: 1. Radiation flux.*—Authors' abstract.

6.5-149

551.521.4

Ashburn, Edward V., **The altitudes of the luminous layers in the earth's atmosphere.** *Journal of Atmospheric and Terrestrial Physics*, 6(1):67-68, Jan. 1955. table, 5 refs. DWB—Supports arguments by D. R. BATES and A. DELGARNO (1953) that published height determinations of the night airglow are too high. The true extinction coefficients for $5577 \text{ \AA}$ are higher than those generally used. *Subject Heading: 1. Night airglow.*—C.E.P.B.

6.5-150

551.521.61:551.509.5

Wörner, Heinrich, **Die Vorhersage der Ortshelligkeit.** [Forecasting local brightness.] *Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, Abhandlungen*, 5(33), 1954. 54 p. 23 figs., chart, 11 tables, refs., 11 eqs. DWB—This memoir is written to aid electric supply companies. Pt. 1 takes up the theoretical illumination on a horizontal surface by direct sun and scattered light with different solar elevations and atmospheric transmissions. Diagrams show sun's height at different hours and solar declinations, and for Potsdam in different seasons. The effect of cloudiness is next considered. Pt. 2 discusses the technique of brightness measurement and Pt. 3 the characteristics of the photo-element and recording apparatus. In Pt. 4 the accuracy of forecasts of brightness for Berlin is examined. Appendixes give instructions for using the instrument and for coding the readings, with practical examples. *Subject Headings: 1. Daylight illumination 2. Illumination forecasts.*—C.E.P.B.

6.5-151

551.521.64

Gill, P. S., **Variation in cosmic ray intensity at sea-level and mountain altitudes.** *Science and Culture*, Calcutta, 19(10):[3]-[4], April 1954. DLC—A lecture giving general factual

knowledge of intensity variations in cosmic radiation with latitude, around the geomagnetic equator (longitude effect), temperature, height, hard and soft components, zenith angle, pressure and source, and various combinations of these variables (e.g., variation of latitude effect with height or vice-versa). Sporadic effects such as during magnetic storms or solar flares are also mentioned. *Subject Headings:* 1. Cosmic ray variations at high altitudes 2. Cosmic ray variations at sea level 3. Cosmic ray intensities.—*M.R.*

6.5-152

551.521.64

Neher, Hewey Victor; Peterson, V. Z. and Stern, E. A., **Fluctuation and latitude effect of cosmic rays at high altitudes and latitudes.** Pasadena, Calif., California Institute of Technology, Norman Bridge Lab. of Physics, Jan. 1953. 45 p. 20 figs. (1 fold.) **DWB**—Simultaneous flights were made (for the purpose of studying the time and latitude fluctuations of cosmic rays at high altitudes) at Bismarck, N. Dak. and on ships going from Boston to Thule (4 flights) and at Thule, Greenland (5 flights), near the geomagnetic pole. A special radiosonde ionization chamber was used and 28 successful flights made in all. It was found that at 90,000 ft fluctuations of 10% in primary radiation would occur in a few days, and would occur simultaneously at both stations, and in both high and low momentum particles (1.5 to 15 Bev/c). The high level fluctuations correlated highly with fluctuations in neutron and meson components at the ground. Only important geomagnetic effect was in total ionization at 30 to 50 thousand ft (negative with 1 gt) and positive latitude effect above 60,000 ft at high latitudes. A wealth of data is given in table, charts and graphs. *Subject Headings:* 1. Cosmic ray variations at high altitudes 2. Cosmic ray variation with latitude 3. Ionization chambers 4. Cosmic ray radiosonde ascents 5. Bismarck, N. D. 6. Thule, Greenland.—*M.R.*

6.5-153

551.521.9:621.396:612.014.42

Harmsen, Hans, **Sind Ultrakurzwellen gesundheitsschädlich?** [Are ultra-short waves dangerous to health?] *Umschau*, 55(1):21, Jan. 1, 1955. 3 refs. **DLC**—Very powerful ultra-short waves increase the fertility of the first generation of rats, favor the development of the young and increase ratio of males to females. The next generation showed no effects. Fields of ordinary strength are not harmful. *Subject Heading:* 1. Short wave radio effects.—*C.E.P.B.*

TEMPERATURE

See also: **Daily means of air temps.** (Lucke, Haake), 6.5-37; **Forecasting of blossoming** (Pearce), 6.5-51; **Heated anemometers** (Lugeon), 6.5-56; **Soil temps.** (Olsson), 6.5-168; **Snow density** (Diamond, Lowry), 6.5-256.

6.5-154

551.524:551.526:551.311.18

Goedecke, Erich, **Über den Zusammenhang zwischen Eis- und Kältesumme sowie Oberflächentemperatur in der Elbe- und Wesermündung während der Winter 1903-1950.** [On the connection between accumulated sums of ice and cold and the surface temperature in the mouths of the Elbe and Weser in the winters 1903-1950.] *Annalen der Meteorologie*, 6(5/6):151-163, 1953/54. 5 figs., 8 tables, 21 refs. German and English summaries p. 151. **MH-BH**—Numbers of days with coastal ice (means of 20 stations), accumulated coldness according to an empirical formula, and mean winter surface temperatures in 4 coast areas are arranged in order of severity. Water temperatures at 4 lightships are set out in order of years. Relations between ice days and corresponding seasonal and monthly temperatures show nearly linear correlations. *Subject Headings:* 1. Ice cover duration 2. Temperature summations 3. Coastal water temperatures.—*C.E.P.B.*

6.5-155

551.524:551.571:551.515.8

Laikhtman, D. L. and Iudin, M. I., **Transformatsiia nizhnego sloia vozdukh pod vlianiem podstilaushchei poverkhnosti.** [Transformation of the lower air layer under the influence of the underlying surface.] *Akademiia Nauk SSSR, Doklady*, 93(2):249-252, Nov. 11, 1953. 4 refs., 24 eqs. **DLC**—Processes of air transformation under the influence of an active surface in which the changes in temperature and humidity are closely connected are always complex.

However, up to recent times problems of changes of heat-and-moisture content in moving air masses were artificially segregated and the results were therefore limited because of the faulty assumption of boundary conditions. In this paper the author eliminates this defect and derives the solution of a practical case of a stable process of transformation. The method of reducing a system of equations to one equation is also applicable to the general cases of non-stable transformation. *Subject Headings:* 1. Air mass transformation 2. Heat and moisture effects.—A.M.P.

6.5-156

551.524.3:551.311.1

*Rodhe, Bertil (*Swedish Met. and Hydrological Inst.*), **On the relation between air temperature and ice formation in the Baltic.** Sweden. *Meteorologiska och Hydrologiska Institut, Meddelanden, Ser. B*, No. 10, 1953. 10 figs., 6 tables, 11 refs., eqs. Price: Kr. 1. Reprinted from *Geografiska Annaler*, Stockholm, Pt. 3/4:175-202, 1952. DWB—The author proposes an iteration method for the solution of the differential equation, describing the cooling of the sea surface on the basis of the temperature difference water-air. An elaborate treatment follows on how to compute the true diurnal mean of temperature and the normal temperature for each day on the basis of harmonic analysis, considering even the different lengths of the months. The theory of ice formation is applied to a number of places in the Gulf of Bothnia and its prognostic applications are outlined. *Subject Headings:* 1. Sea surface cooling 2. Ice forecasting 3. Harmonic analysis 4. Baltic Sea.—A.A.

6.5-157

551.524.34

Callendar, G. S., **A close parallel between temperature fluctuations in east Canada and Britain.** *Royal Meteorological Society, Quarterly Journal*, 81(347):98-99, Jan. 1955. fig., table, 8 refs. DWB—A very close agreement is found between running 10-year averages of temperature (1873-1952) in southern Ontario (5 stations) and Kew. The general trend is similar over all N. Hemisphere, the rise (1891-1920 to 1921-1950) being 0.8-0.9°F (0.02°F./year) compared with the calculated increase of 1°F for a 10% increase of CO₂. *Subject Headings:* 1. Temperature trends 2. Eastern Canada 3. British Isles.—C.E.P.B.

6.5-158

551.524.35(73)

§Krueger, Arthur F., **The weather and circulation of February 1954.** *Monthly Weather Review*, 82(2):60-63, Feb. 1954. 4 figs., table, 6 refs. DWB—Feb. 1954 was the warmest Feb. on record (61 years) for the U. S. as a whole and averaged 20°F above normal in the Dakotas and 10°F above normal in Maine. Monthly mean 700 mb heights were well above normal in the U. S. and much below normal in Alaska, N.W. Canada and the Arctic in that section. Blocking highs occurred over Eastern Siberia, Scandinavia and Great Britain. Precipitation was below normal over most of the U. S. and in Texas there were seven places with a record drought. *Subject Headings:* 1. Mild winters 2. Drought 3. Blocking anticyclones 4. United States.—M.R.

6.5-159

551.524.36:519.241.2

Lawrence, E. N., **Estimation of the probabilities of given extreme minimum temperatures.** *Meteorological Magazine*, London, 84(991):1-9, Jan. 1955. 4 figs., 4 tables, 7 refs., 7 eqs. DWB—A method is described of charting the lowest temperature to be expected once in a given month during a given number of years, using an equation based on Gumbel's temperature-probability curves. Results are shown as charts of probable minimum temperatures in East Anglia in May in 5, 10, 25 and 50 years, and the probability that minima in a single May will not fall below various values. Methods of estimating probabilities for a single station from daily, weekly or monthly minima are set out. *Subject Headings:* 1. Minimum temperatures 2. Statistical methods in climatology 3. Gumbel's probability curve.—C.E.P.B.

6.5-160

551.524.36:697

*Penrod, Estel Burdell (*Kentucky Univ., Dept. Mech. Engr.*), **Sizing earth heat pumps.** *Refrigerating Engineering*, N. Y., 62(4):57-62, April 1954. 4 figs., 7 tables, 11 refs. DLC—Significant weather data are given for Lansing, Mich., Lexington, Ky., and Atlanta, Ga., including monthly means for 52-73 years [daily max., min. and mean, record high and year,

record low and year, and mean degree days (36-48 years)], and calculated soil temperature, heating load, cooling load, etc. Temperature-time curves are given for surface temperature and disturbed and undisturbed soil temperature at 6.5 ft for Sept.-Sept., showing load put on system during heating season. Discussion along technical lines is quite complete. *Subject Headings:* 1. Heat pumps 2. Temperature data 3. Lansing, Mich. 4. Louisville, Ky. 5. Atlanta, Ga.—*M.R.*

6.5-161

551.524.36(54)

*Raman, C. R. V. (*Met. Off., Santa Cruz, Bombay*), **Abnormal differences in minimum temperatures at Colaba and Santacruz.** *Indian Journal of Meteorology and Geophysics*, 5(1):77-78, Jan. 1954. 2 tables, ref. **MH-BH**—During winter the minimum temperature at Colaba Observatory (in Bombay Island surrounded on 3 sides by the sea) and Santacruz Observatory (on the mainland 12 miles N) 2 miles inland from the sea, differ by 7° or 8°F in the mean and from 0 to 14°F in extreme cases, as shown by data for 1949-53. An analysis of anomalies (on clear vs. cloudy nights) shows that the larger differences occur on clear nights, and the smaller ones on partly cloudy or cloudy nights. Cold waves with strong advection of cold air are not accompanied by such great differences as would be expected for clear nights. *Subject Headings:* 1. Minimum temperature anomalies 2. Cloudiness effects on nocturnal temperatures 3. Marine influence on minimum temperature 4. Colaba Observatory, India 5. Santacruz Observatory, India.—*M.R.*

6.5-162

551.524.37(09)

Rogers, Peter, **Murphy's winter.** *Weather*, 10(1):12-16, Jan. 1955. **DWB**—Murphy's *Weather Almanack* for 1838, issued in 1837, was a popular success mainly because he forecast very cold weather on Jan. 20, when -14°F was recorded at Walton-on-Thames. The frost lasted from Jan. 7 to Feb. 5. *Subject Headings:* 1. Extreme winters 2. England.—*C.E.P.B.*

6.5-163

551.524.4:551.551

Krishna Rao, P. (*Radiation Lab., Meteorological Office, Poona-5, India*), **Fluctuations of temperature near the ground.** *Current Science*, 23(2):47-48, Feb. 1954. 2 figs., 4 refs. **DWB**—Measurements similar to those of L. A. RAMDAS (see item 5.1-8, Jan. 1954, *MAB*) were made by the author at Poona (Central Agrometeorological Observatory) at surface of ground and at 2, 5, 10, 50, 100, 500 mm and 1, 1.8, 3.0, 4.5, 6.1, 7.6 and 9.1 m, with a series of thermocouples made of 40 S.W.G. copper constantan wires coated with thin layer of MgO₂ to minimize radiation effects. The couple is connected in series with a Moll-valvammeter of $\frac{1}{2}$ sec period and shows fluctuations of temperature in the shimmering layer due to small scale turbulence during unstable and stable conditions (day and night). Records made on Feb. 13, 1953 show complete absence of fluctuation when lapse rate was small. Size of turbulent eddies was also tested by using 2 couples separated by increasing differences in height (1, 2, 5, 7.5, 10, 20 and 50 cm). Fluctuations agree up to 7.5 cm. *Subject Headings:* 1. Micro-meteorological temperature measurements 2. Turbulent temperature fluctuations 3. Temperature variations 4. Poona, India.—*M.R.*

6.5-164

551.524.4:551.526.6:551.573

*Neumann, J. and Rosenan, N. (*Met. Service, Tel Aviv, Israel*), **The Black Sea: energy balance and evaporation.** *American Geophysical Union, Transactions*, 35(5):767-774, Oct. 1954. fig., 5 tables, 19 refs., 6 eqs. **MH-BH**—The energy equation is applied to data of four areas of the Black Sea. The data used are as follows: air temperature, pressure and cloudiness (LANDBERG's 1945, bimonthly isopleths); humidity of air (estimates based on humidity data of coastal stations); sea-surface temperatures (observations by British ships); and sea-surface salinity (17‰, SVERDRUP and others in 1946). The results indicate an average annual evaporation of 110 cm, approximately. As in the corresponding latitudes of the oceans, evaporation decreases from south to north and from west to east. Evaporation during the autumn-winter semester considerably exceeds evaporation in the remaining semester. The hydrologic balance determined by SVERDRUP and others for the Black Sea indicated an annual evaporation of 84 cm. It is suggested that the precipitation and runoff terms of that balance are larger to an extent needed to compensate for the larger value of evaporation derived from the

energy balance. The terms precipitation and runoff are subjected to a re-examination. The authors' estimate of annual precipitation is in close agreement with that given by SVERDRUP (58 cm). By combining the figure for evaporation (energy balance) with the precipitation estimate and with data for the in- and outflow through the Bosphorus, a runoff from the catchment to the sea amounting to 10 cm/year is required. Hydrographic data for the catchment available to the authors, first communicated by Russian authors after publication of SVERDRUP's hydrologic balance for the sea, cover 92% of the catchment and account for a runoff of 91 cm/year. Thus, the evaporation figure derived from energy balance computations receives close support from hydrographic data. *Subject Headings:* 1. Energy exchange sea-atmosphere 2. Energy balance 3. Evaporation from seas 4. Black Sea.—*Author's abstract.*

6.5-165

551.524.7:551.510.534

Pressman, Jerome, Seasonal and latitudinal temperature changes in the ozonosphere. *Journal of Meteorology*, 12(1):87-89, Feb. 1955. 6 figs., table, 8 refs. DWB—Using assumed densities at 20 to 57.5 km and further assuming that energy absorbed by ozone went into heating, meridional cross sections 90°N-S of 24 hr temperature increment are given for 6 dates. They range up to 11°C at 45 km over poles in summer. Below 20 km increment is negligible. *Subject Heading:* 1. Ozonosphere temperatures.—*C.E.P.B.*

SOIL TEMPERATURE

6.5-166

551.525:551.588.6

*Coutts, J. R. H., Soil temperatures in an afforested area in Aberdeenshire. *Royal Meteorological Society, Quarterly Journal*, 81(347):72-79, Jan. 1955. 2 figs., 6 tables, 16 refs., 4 eqs. DWB—Observations were made with mercury-in-steel thermometers at 1, 6, 12 and 18 inches depth during 1952-53 in a conifer forest (8-10 ft) on a slope near Ballater with soil stony loam below 1 in. of peat. Rainfall 833-733 mm/year, respectively. Weekly means of air and soil temperature are shown by curves. Mean annual temperatures are similar throughout the profile. Diffusivities are calculated from ratios of amplitudes air-1 in. and 1-6 in. Diurnal variation is very small below 6 in. It was found that reasonably good weekly means could be found from daily extremes. *Subject Headings:* 1. Forest influences 2. Soil temperatures 3. Aberdeenshire, Scotland.—*C.E.P.B.*

6.5-167

551.525.2

Ashmore, S. E., Spirits in the grass minimum. *Weather*, 10(1):30, Jan. 1955. DWB—Referring to letters in *Weather* by G. O. LAWTON, E. GOLD and R. M. POULTER, possible causes for grass minimum thermometer reading higher than shade minimum are discussed. *Subject Heading:* 1. Grass temperatures.—*C.E.P.B.*

6.5-168

551.525.2 551.524.3

*Olsson, Axel, Undersökning över vältnings inverkan på marktemperaturen och på lufttemperaturen närmast markytan. [Effect of rolling on soil temperature and near-surface air temperature.] (K.) *Lantbruksakademien, Stockholm, Tidskrift*, 92(2/3):220-241, 1953. 9 figs., 7 tables, 21 refs. In Swedish; English summary p. 240-241. DLC—Data obtained at Sala Agricultural Experiment Station, Sweden in 1930, 1940, 1942 and 1943, on air and soil temperature are presented in tables and analyzed graphically and in extensive text. The purpose of the experiments was to determine the effect of rolling various types of soils with different kinds of rollers (ordinary, Cambridge, and concrete type) on soil temperature at 10 cm depth and air temperature at 5 cm above ground, specially with respect to protection against frost when crops are tender. The first 3 trials were on mineral soils, then, simultaneously on mineral and humus soils. Rolling with a concrete roller had twice the effect (soil temperature 1.0°C and air temperature 2.0°C) of rolling with other rollers, and raised the temperature by increasing heat conductivity. *Subject Headings:* 1. Soil rolling effects on soil temperatures 2. Frost protection 3. Soil temperatures 4. Sweden.—*M.R.*

6.5-169

551.525.5(09)

Pokshishevskii, V. V., Zaslugi russkikh zemleprokhodstev v poznanii vечноi merzloty. [The achievements of Russian land prospectors in the knowledge of permafrost.] *Priroda*,

Moscow, 5:67-71, May 1954. 13 refs. **DLC**—The history of the knowledge of permafrost is traced back to more than a hundred years before GMELIN's account of it in 1752. Testimonial evidence is cited that old Russian land prospectors in Siberia were familiar with permafrost as early as 1636. *Subject Headings: 1. History of permafrost research 2. Permafrost 3. U.S.S.R.—I.L.D.*

SEA TEMPERATURE

See also: Temp. summations (Goedecke), 6.5-154; *Energy balance* (Neumann, Rosenan), 6.5-164; *Paleo-climatology* (Emiliani), 6.5-289.

6.5-170

551.526.6(261)

Fall of sea temperature, Gulf Stream, North Atlantic Ocean. *Marine Observer*, 25(167):27, Jan. 1955. **MH-BH**—Feb. 25, 1954, sea temperature fell from 62°F in 41°57'N, 48°W at 19h 30m GMT to 42°F at 21h 18m a short distance to W.S.W., then rose to 54°F. On March 17-18, 1954, in about 39½°N, 49½°W, steaming E.N.E. sea temperature fell from 63°F at 23h 30m to 43°F at 4h 30m rising again to 63°F at 7h. Air temperature changes were similar but much smaller. *Subject Headings: 1. Sea temperatures 2. North Atlantic.—C.E.P.B.*

PRESSURE AND WIND

PRESSURE

See also: Pressure waves (Wadsworth), 6.5-76; *Upper level troughs* (Smith, Forsdyke), 6.5-127; *Wind deviations* (Jenkinson), 6.5-202.

6.5-171

551.54:543.3

Piccardi, Giorgio (*Florence Univ.*) and Doat, Henry-Yves, **Rapporti fra fenomeni chimico-fisici e fenomeni ambientali: primi risultati delle esperienze condotte a Vienna.** [Relationships between chemico-physical phenomena and environmental phenomena: first results of the experiment made at Vienna.] *Geofisica e Meteorologia*, Genoa, 1(6):106-108, Nov./Dec. 1953. 3 figs., 4 refs. **MH-BH**—Comparison of curves representing rate of precipitation of BiOCl (Bismuth Oxychloride) in enclosed (lead shield) tanks in Florence and in Vienna (Unter-Tullnerbach) during July-Sept. 1953, shows striking similarity, even though these places are far apart and separated by the high Alps. Conclusion is that atmospheric pressure, electrical or humidity changes could affect the rate of precipitation, but since tanks are enclosed, only pressure and electrical conditions could be responsible. *Subject Headings: 1. Physico-chemical effects of weather 2. Florence, Italy 3. Unter-Tullnerbach, Austria.—M.R.*

6.5-172

551.541:551.515.4

Bhalotra, Y. P. R., **Barograph antics.** *Weather*, 9(11):355, Nov. 1954. **DWB**—Pressure variations during some thunderstorms in India show alternating rapid rises and falls with corresponding falls and rises of temperature, but no relation to wind speeds in a squall. *Subject Headings: 1. Microbarometric oscillations 2. Thunderstorms 3. India.—C.E.P.B.*

6.5-173

551.541

Hoddinott, M. H. O. and Ashmore, S. E., **Barograph antics.** *Weather*, 10(1):16-20, Jan. 1955. 4 figs., 5 refs. **DWB**—Discussion of irregular short-period pressure oscillations with special reference to July 6, 1952 over England. Peak travelled northward at 50 m.p.h., probably with wind at 600 mb. Maximum amplitude 3.5 mb. No particular relation to weather though conditions were thundery. The oscillations of Sept. 5, 1949, are also discussed. *Subject Headings: 1. Microbarometric oscillations 2. England.—C.E.P.B.*

6.5-174

551.541:551.596

Pressure changes associated with supersonic bangs. *Meteorological Magazine*, London, 83(1954):348, Nov. 1954. photo. **DWB**—A barogram is reproduced showing a rise of 1.3 mb followed by a fall of 0.8 mb during loud supersonic bangs. *Subject Headings: 1. Microbarometric oscillations 2. Acoustical phenomena.—C.E.P.B.*

6.5-175

551.542:629.13

Williams, J. E. D., **Airliners cut overwater time.** *Aviation Age*, N. Y., 21(2):56-61, Feb. 1954. 2 figs. DWB—The construction and use of the KLM (Holland) computer and the IANC (New York) template for calculating average drift path and minimal flight path over North Atlantic. Use of these devices enables the navigator to quickly compute optimum route from any given weather map, thus saving up to an hour in ordinary flying from New York to Shannon. The KLM minimal time path computer is really a drawing instrument made to scale of standard 500 mb chart, and is used in plotting time fronts on these charts. The IANC (International Airline Navigators Council) pressure pattern template is used for finding flight time along any path chosen and requires no forecast. *Subject Headings:* 1. Minimum flight path computers 2. Templates 3. Pressure pattern flying 4. Aeronautical instruments 5. North Atlantic.—M.R.

6.5-176

551.543:525.6

Chapman, Sydney, **Tides in the atmosphere.** *Scientific American*, 190(5): 36-39, May 1954. 4 figs. DLC—Atmospheric tides were suggested by NEWTON and attempts were made to detect the atmospheric lunar tides by LAPLACE (he calculated $\frac{1}{4}$ mm in tropics and less at other latitudes). Calculation of 4752 daily readings and later 30,000 pressure values at Paris failed to show a lunar tide. Recent records in tropics, temperate zone and Arctic show that solar tidal effect and solar heating effect obscures the lunar tidal effect, and that the solar tide is less than the lunar tide in the sea (by 1:2.4); the fact that resonance of atmosphere is nearly 12 hours amplifies the solar tides at expense of lunar, so the solar tide is 15-20 times that of the lunar. LEFROY in 1842 found a 0.1 min lunar tide at St. Helena (17 months record) and CHAPMAN in 1918 found 0.01 mm tide (equal to $7\frac{1}{4}$ " of air) over 64 years at Greenwich Observatory. In the ionosphere however it amounts to a rise or fall of a mile or more in the reflecting layers. *Subject Headings:* 1. Atmospheric tides 2. Lunar tides 3. Ionospheric tides.—M.R.

6.5-177

551.543:526.7

Tomaschek, R., **Variations of the total vector of gravity at Winsford (Cheshire), Pt. I. General results and maritime load influences.** *Royal Astronomical Society, Monthly Notices, Geophysical Supplement*, 6(9):540-556, April 1954. 9 figs., table, 7 refs. DWB—Observations of variation of vertical and horizontal components of gravity April 16-24, 1951, are analyzed into tidal influences including effect of load of tidal waters (attraction and deformation), meteorological influences (to be dealt with in Pt. 3) and instrumental effects. *Subject Headings:* 1. Gravity variations 2. Winsford, England.—C.E.P.B.

6.5-178

551.543.1

New York University. College of Engineering. Research Div., **Atmospheric oscillations.** Contract AF 19(122)-49, Project No. 122, Progress Report, No. 11, Oct. 15, 1951-Jan. 14, 1952, pub. Jan. 14, 1952. 10 p. 5 refs. DWB—An administrative report. Research concentrated mainly on the diurnal and semidiurnal pressure wave in the U. S., the effect of clear and cloudy weather, thermal tide and seasonal influences on these waves. One phase of the work deals with the relation to geomagnetic and solar data. *Subject Headings:* 1. Diurnal pressure waves 2. Solar influences 3. United States. I. Haurwitz, Bernhard.—A.A.

6.5-179

551.543.1:532.596

Thrane, P., **The tilt of a 12-hourly atmospheric tidal wave.** *Royal Meteorological Society, Quarterly Journal*, 81(347):9-17, Jan. 1955. 9 refs., 38 eqs. DWB—Pressures in Alps show a lag of 2 hrs in extremes of 12 hr wave at 4000 m compared with sea level. This is examined theoretically as a forced oscillation in an ideal gas in a canal coincident with the equator, characterized by thermal and gravitational excitation due to the sun. The equations of perturbation are set out and a wave solution is developed, valid for a limited time interval. It is shown that such waves must have a variation of phase with height if there is to be vertical transport of energy. *Subject Headings:* 1. Diurnal pressure variations 2. Energy transport 3. Alps.—C.E.P.B.

6.5-180

551.543.3

Wadsworth, J., **Oscillations of barometric pressure.** *Meteorological Magazine*, London, 83(982):120, April 1954. 4 refs. **MH-BH**—Suggests that absence of recurrence tendencies in Kew pressure (*see item* 5.2-156, Feb. 1954, *MAB*) is due to position in an amphidrome near coast. *Subject Heading:* 1. Pressure waves.—*C.E.P.B.*

6.5-181

551.547.1:551.506.5(98)

Bedel, Bernard, **Campagne d'été 1951 au Groenland; déterminations altimétriques par mesures barométriques corrigées.** [Summer operations 1951 in Greenland; height determinations by corrected barometric measurements.] *Annales de Géophysique*, 10(2):162-167, April/June 1954. 5 figs., 2 tables, 4 eqs. **DWB**—The method used in correcting altimeter measurements in Greenland in the summer of 1951 is explained. The method is based on a correction factor derived from the thickness of an isobaric layer as appearing from nearby aerological measurements. The average error in the height determinations with altimeters was ± 40 m. The author believes that better accuracy could be obtained from mercury barometers. *Subject Headings:* 1. Altimetry 2. Arctic expeditions 3. Greenland.—*G.T.*

TURBULENCE AND GUSTINESS

See also: **Hydromechanics** (Kochin), 6.5-7; **Surface wind from pressure** (Wyrтки), 6.5-38; **Turbulent systems** (Blackadar), 6.5-106; **Atmos. turbulence** (De Pasquale), 6.5-107; **Temp. fluctuations** (Krishna Rao), 6.5-163; **Evaporation theory** (Payne), 6.5-208; **Turbulence diffusion** (Kuroiwa), 6.5-226.

6.5-182

551.554 551.556

Pagon, W. Watters and others, **Discussion of variation of wind velocity and gusts with height** [by R. H. Sherlock]. *American Society of Civil Engineers, N. Y., Proceedings*, v. 79, Separate No. D-126, March 1953. 20 p. 14 figs., 4 tables, eqs. **DLC**—PAGON points out that the use of one-sixth power law fits SHERLOCK's (*see item* 4B-322, Feb. 1953, *MAB*) test data well, but that over large areas of water a more rapid increase of velocity with height at low elevations occurs "so that the gradient wind is approached more rapidly at low elevations than is indicated by the sixth power law thus producing greater pressures on high buildings and bridges." IRVING A. SINGER and MAYNARD E. SMITH criticize the work as being based largely on data obtained at only one location and they compare studies carried out at the Brookhaven National Laboratory with SHERLOCK's work. PERCY H. THOMAS and M. H. FRESN comment on the variation of wind velocity with height on peak gust wind velocities and the effects of wind velocity and gustiness upon wind power. ROBERT A. McCORMICK comments on the validity of any empirical relationship that describes the structure of low level wind in one storm example. The various objections and criticisms are taken up by R. H. SHERLOCK. *Subject Headings:* 1. Wind velocity variations 2. Wind effects 3. Upper air wind variations. I. Sherlock, R. H.—*I.L.D.*

6.5-183

551.551:551.557:629.13

Cole, R. A., **Some atmospheric phenomena and their possible bearing upon transport aeroplanes.** *Aeronautics*, London, 31(2):146-155, Sept. 1954. 6 figs. **DLC**—Discussion of recent aircraft investigations of clear air turbulence. Loads on aircraft are explained, including effects of alternating up- and down-gusts. Variation of load due to oblique entry into a gust may reach 9 m/s across a span of 31 m. Flying through a series of gusts giving alternations near the natural oscillation period of an aircraft may cause resonance and large structural distortions. Dynamic magnification of oscillations is illustrated by examples. Possible effects on design are considered. *Subject Headings:* 1. High level turbulence 2. Aeronautics.—*C.E.P.B.*

6.5-184

551.551

Syoono, S. (*Tokyo Univ.*), **Frequency distribution functions of velocities in turbulent flow.** *Meteorological Society of Japan, Journal*, 2nd Ser., 31(9):299-305, Sept. 1953. 3 figs., 11 refs., 27 eqs. **MH-BH**—The frequency distribution function of velocities in turbulent

flow is derived from the theory of random walk, on the assumption that the phases of elementary waves are at random and independent from each other. The normal distribution is obtained for the frequency of velocity fluctuations as the first approximation. The second approximation is also obtained. As the number of elementary waves increases, the distribution tends to the normal distribution asymptotically. The frequency distribution of the velocity has a modified form of the normal distribution. *Subject Headings: 1. Turbulence spectrum 2. Turbulent flow.—Author's abstract.*

WIND

See also: Balloon network (S. Calif.), 6.5-95; *Northwesters* (Ramaswamy, Bose), 6.5-125; *Relation of wind to showers* (Gentry, Moore), 6.5-242.

6.5-185

551.552:656.6(261)

§Kopenhagen, Rudolf, 21 *Tage Backstagsbrise. Richtige Überlegungen vor einer Ferienreise sichern den Erfolg.* [21 days following the wind. Correct planning of a holiday voyage ensures success.] *Wetterlotse*, No. 80:255-264, Dec. 1954. 5 figs., table. Note by M. RODEWALD, p. 254-255. **DLC**—Account of a record voyage in a sailing yacht from Brest via Madeira and Azores to Bremen in July 1954 mostly under a specially designed "trade spinnaker." The value of preplanning to take advantage of statistically prevailing winds, and of synoptic planning during voyage is emphasized and is illustrated by synoptic charts and a wind frequency chart for July. RODEWALD adds an introduction on meteorological navigation of sailing ships. *Subject Headings: 1. Meteorology in navigation 2. Wind distribution 3. North Atlantic.—C.E.P.B.*

6.5-186

551.553.11

Stern, Melvin E., *Theory of the mean atmospheric perturbations produced by differential surface heating.* *Journal of Meteorology*, 11(6):495-502, Dec. 1954. 2 figs., table, 7 refs., 37 eqs. **DWB**—Heating of a horizontal undisturbed air current passing over a flat island on a rotating earth is examined mathematically. "It is shown that the mean motions may be specified in terms of an 'equivalent mountain.' This depends, in general, on the Coriolis parameter as well as the surface temperature, undisturbed wind speed, and the eddy conductivity of the heated region. The theory is applied to the small-scale sea-breeze problem, and it is shown that . . . it is possible to explain the frequently observed phase relation between the diurnal temperature wave and the sea breeze without introducing friction." *Subject Heading: 1. Sea breeze theory.—From author's abstract.*

6.5-187

551.553.11

Zenker, H., *Über den Pseudoseewind.* [On the pseudo sea breeze.] *Zeitschrift für Meteorologie*, 8(1):19-25, Jan. 1954. 3 figs., table, 7 refs. **MH-BH**—On the basis of continuous nuclei count measurements carried out on three days in April 1954 on the Baltic coast (Heringsdorf) the author investigated the relationship between the pseudo-sea breeze as defined by NEUBERGER and wind direction and velocity. It was impossible to determine from the change in wind direction the precise time at which the sea breeze is transformed into a pseudo-sea breeze. The latter arises in high pressure areas during land and sea breeze when the wind velocity is slight and after all shifts from land to sea breeze which are not associated with frontal processes and during slight air movement. *Subject Headings: 1. Pseudo sea breezes 2. Wind velocity 3. Baltic coast.—I.L.D.*

6.5-188

551.553.8

Reynolds, G., *The gale on Merseyside, 15-16 January 1954.* *Weather*, 10(1):21-22, Jan. 1955. 2 figs. **DWB**—Variations of wind speed and pressure at Bidston are related to passage of fronts. Steady wind of gale force persisted 22 hours and 50 mph for 6 hours. Maximum gust 87 mph. *Subject Headings: 1. Gales 2. England.—C.E.P.B.*

6.5-189

551.555.8(545)

*§Roy, S. C. (*Met. Office, New Delhi*), *Is the incidence of unusually dusty weather over Delhi in May and June for the two consecutive summers of 1952 and 1953 an indication that*

the Rajasthan Desert is advancing towards Delhi? *Indian Journal of Meteorology and Geophysics*, 5(1):1-15, Jan. 1954. 3 tables, charts. MH-BH—After a discussion of two main types of dust storms experienced in NW India: 1) "Loo" or hot dry dust raising winds and 2) "Andhi" or dry thundersqualls; and "dust-fog" or poor visibility caused by imported or settling dust, the author presents tables showing for May and June, respectively, at Delhi Airport, the number of hours of dust of the 3 above types, and the frequency of "western disturbances" which are usually responsible for dust storms or squalls in India for each year from 1945-1953 and the mean for the period. Another table shows the annual rainfall at Delhi for each year from 1854-1953. It can be seen that rainfall is exceedingly variable (60" in 1933, 10" in 1929 and 8" in 1868), but that the last two years were not unusually dry nor is there any trend evident which might indicate progressive desiccation in this region in spite of the two dusty years. Synoptic conditions favorable for dust are illustrated by a series of charts for June 25-28, 1953. Artificial rainfall cannot relieve the situation. *Subject Headings*: 1. Dust storm frequencies 2. Rainfall data 3. Synoptic conditions for dust storms 4. Delhi, India.—M.R.

WIND EFFECTS

See also: Wind variations (Pagon), 6.5-182.

6.5-190

551.556:551.311.3

Pugh, J. C., Sand movement in relation to wind direction as exemplified on the Nigerian coastline. *Ibadan, Nigeria. University College. Dept. of Geography, Research Notes*, No. 5, April 1954. 14 p. 6 figs., 9 maps. DWB—The author presents evidence showing that the dominant cause of sand movement and sandspit growth on the Nigerian coastline is correlated closely with wind direction. Maps show the effect of sand movement upon the coastline and the directions of the dominant winds. *Subject Headings*: 1. Wind effects on sand movement 2. Wind direction 3. Nigeria.—I.L.D.

6.5-191

551.556.1:551.515.2:633.61

Poey, Federico, Manera y formula de estimar los daños de los ciclones sobre la caña. [Method and formula for estimating cyclone damage to sugar cane.] *Asociación de Técnicos Azucareros de Cuba, Boletín Oficial*, 11(9):455-457, Nov. 1952. MH-BH—According to the method suggested in this paper total losses in sugar cane can be expressed in terms of percentage values by counting the number of healthy, partly damaged and completely broken canes in representative sections. *Subject Headings*: 1. Wind damage 2. Sugar cane.—G.T.

6.5-192

551.556.1:633.11

Tsuboi, Y., Studies on wind injury to wheat, Pt. 1, On the way to prevention. *Journal of Agricultural Meteorology*, Tokyo, 7(1):15-16, Dec. 1951. 2 figs., 8 refs. Also: Tsuboi, Y. and Izumi, S., Studies on wind injury to wheat, Pt. 2, Investigation of wind break. *Ibid.*, 7(2):45-47, June 1952. 3 figs., 2 tables. Both articles in Japanese; English summary p. 47. MH-BH—An experimental field in which wind damage to wheat was investigated is described and illustrated. Thirteen typical categories of wind damage are established and shown in schematic drawings in conjunction with the mechanism of flow (influenced by small-scale orographic effects) which caused the damage. (Pt. 2 is same item as 4.7-133, July 1953, MAB.) *Subject Headings*: 1. Wind damage 2. Agricultural meteorology 3. Shelter belts 4. Wheat.—G.T.

6.5-193

551.556:69 551.5:6

Hewson, E. Wendell (*Univ. of Michigan*), Meteorological engineering. *Michigan Technic*, 72(4)13, 26, Jan. 1954. 2 photos. DLC—After tracing the development of meteorology as a profession in the U. S., the author lists and illustrates a few applications of specialized knowledge to engineering problems. Snow, wind and ice loads on buildings, structures and power lines; wind generators and solar furnaces for power; highway construction and maintenance as well as safety, and a dozen other types of applications are described. The Univ. of Mich. experimental installation for study of wind loading during storms (on power lines and poles)

was one of the first of its kind and has not been duplicated in 20 years (photograph shows installation). *Subject Headings: 1. Engineering meteorology 2. Wind loads on structures.*—M.R.

6.5-194

551.556.2:551.584:61

Caborn, J. M., *The influence of shelter-belts on microclimate.* *Royal Meteorological Society, Quarterly Journal*, 81(347):112-115, Jan. 1955. 15 refs. DWB—The mechanics of a shelter-belt are explained, showing why a partly permeable belt gives the greatest area of useful protection. Effects on temperature, sunshine, humidity and evaporation are summarized. *Subject Heading: 1. Shelter belts.*—C.E.P.B.

6.5-195

551.556.2

Fuss, F., *Untersuchungen zur Frage des Windschutzes in gärtnerischen Kulturen* [Investigations of wind-breaks in garden cultures. Pt. 1]. *Angewandte Meteorologie*, 2(3):86-95, Nov. 1954. 8 figs., 2 tables. MH-BH—Horizontal wind speed was measured at heights of 20 and 45 cm in a field of barley 10 cm high, on either side of a brushwood fence and a solid obstacle, both 80 cm high, in flat land near R. Elbe. Results as % of wind in open are shown for various wind speeds and directions as profiles from 12×ht of obstacle to windward to 16 times to leeward. Soil temperature at 5 cm and soil humidity were measured to leeward of solid obstacles 1.5 m high. [To be continued.] *Subject Heading: 1. Shelter belts.*—C.E.P.B.

6.5-196

551.556:551.311.3:638.4

Turfianskii, G. F., *Bor'ba s vetrovoi erosiĭ na Nizhnedneprovskikh peskakh.* [Combating wind erosion in the sands of the lower Dnieper.] *Vinodelie i Vinogradarstvo SSSR*, Moscow, No. 5:27-30, May 1952. DLC—In connection with the forthcoming completion of Kakhovskaia Hydroelectric Plant and the opening of the South Ukrainian Canal, large areas of arid lands will be irrigated and become available for agriculture and viticulture in particular. Author discusses the causes and effects of wind erosion in the sands and suggests a series of definite successive measures of combatting drifting sands and setting up vineyards in the plains of the lower Dnieper. A schematic drawing explaining how to organize and lay out a future vineyard on sands surrounded by protective forest belts is added. *Subject Headings: 1. Wind erosion 2. Shelter belts 3. Viticulture 4. Dnieper Region, U.S.S.R.*—A.M.P.

6.5-197

551.556.2:551.584:551.588.6

§Gloyne, R. W., *Some effects of shelterbelts upon local and microclimate.* *Forestry*, Oxford, 27(2):85-95, 1954. 5 figs., 22 refs. DLC—The effect of a tree barrier on climate of neighboring fields is considered. Airflow past barriers of different permeability is shown schematically in section and plan. Author then turns to restriction of wind speed by large plantations and multiple barriers. Effects, especially advantageous in spring, on radiation, temperature, humidity and evaporation are briefly considered. A map of British Isles estimates wind speed on hill sites and indicates where shelter is desirable. *Subject Heading: 1. Shelter belts.*—C.E.P.B.

6.5-198

551.556.2

The Kamyshin-Stalingrad shelter belt—a barrier against the desert wind. *Irrigation and Power*, New Delhi, 10(2/3):147-148, April/July 1953. DWB—The first of 8 shelter belts proposed for southeast U.S.S.R. has been completed in 3½ years instead of 15, according to a "Soviet News" report. Belt consists of 3 strips 55 yards wide and 320 yards between strips. The purpose is to reduce hot dry winds by successive stages. Snow conservation measures were carried out in winter to provide more moisture in spring for seedlings. *Subject Headings: 1. Shelter belts 2. Hot wind control 3. Stalingrad Area, U.S.S.R.*—M.R.

6.5-199

551.556.3:621.311.24

*Serra, Louis, *Le vent en France et ses possibilités d'utilisation.* [Wind in France and possibilities of its utilization.] *La Météorologie*, 4th Ser., No. 32:273-292, Oct./Dec. 1953. 14 figs., 2 plates. French, English and Spanish summaries p. 273. DWB—Since 1947 a

network of experimental wind-energy stations has been set up in France, with wind indicators calibrated to give the energy received per square meter of surface rather than in speed (m/sec). The energy is proportional to the cube of the speed. The network is shown on a chart. The mountainous regions are neglected since the instruments would be subject to icing failure and furthermore there is enough hydroelectric power available there. Elsewhere the network is quite uniformly distributed. A graph shows the normal (1890–1909) values of monthly wind speed which will occur at the Eiffel Tower (or) 10%, 25%, 50%, 75% and 90% of the time. The stability of the monthly mean wind speed frequencies is represented by an index which varied greatly from one place to another and even more sharply when energy (v^3) is used as basis for index instead of speed (v). *Subject Headings:* 1. Wind energy 2. Wind power stations 3. Wind speed data 4. France.—*M.R.*

6.5–200

551.556.4 532.5:551.311.2/3

Velikanov, M. A., *Dvizhenie tiazhelei chastitsy v turbulentnom potoke*. [Movement of a heavy particle in turbulent flow.] *Akademiia Nauk SSSR, Doklady*, 85(3):555–558, July 21, 1952. 11 eqs. **DLC**—Approximate equations for the movement of heavy particles in turbulent flow are derived. The fact that the inertia forces are greater for solid than for fluid particles so that the effect of the inertia forces will be greater for the high frequencies of the spectrum of velocity oscillations than for the low frequencies, and greater for large than for small magnitudes was taken into account. *Subject Headings:* 1. Fluid dynamics 2. Wind transport.—*I.L.D.*

6.5–201

551.556.4:595.7

Zallesskii, I. U. M., *Rol' vetra v vozniknovenii poleta u nasekomykh*. [Role of wind as a factor in the flight of insects.] *Priroda*, Moscow, 42(11):85–90, Nov. 1953. 6 figs., refs. **DLC**—Science (paleontology) does not have a definite answer to the question of progressive evolution of flight ability of insects and the gradual development of their wings. In this paper the author presents his own hypothesis of the starting of insect flights—first as a passive function of resistance to blowing winds, the gradual development of wings from chest segments, their progressive growth and further utilization. The ability to fly progressed parallel with the evolution of the insects and their wings. *Subject Headings:* 1. Wind effects on insect flight 2. Entomology.—*A.M.P.*

UPPER AIR WINDS

See also: **Jet stream** (Riehl, others), 6.5–1; **Variation of wind** (Durst), 6.5–41; **Vertical velocities** (Fleagle, Endlich), 6.5–116; **Project jet stream** (English, others), 6.5 121; **Weather and circulation** (Klein), 6.5–122; **Jet Stream** (Riehl, others), 6.5–123; **Atmos. phenomena** (Cole), 6.5–183.

6.5–202

551.557:539

Teichmann, Horst, *Wettereinfluss von Atomexplosionen als Störung periodischer Strömungen in der Stratosphäre*. [Weather influence of atomic explosions as a disturbance of periodic currents in the stratosphere.] *Naturwissenschaften*, 41(21):498, Nov. 1954. **DWB**—Suggests that atomic explosions, reaching into the stratosphere, cause small disturbances which may be magnified by the periodic oscillations of the streamlines there. *Subject Headings:* 1. Atomic explosions 2. Stratospheric winds.—*C.E.P.B.*

6.5–203

551.557.3:551.547.3

Jenkinson, A. F., *The relationship between standard deviation of contour height and standard vector deviation of wind, with practical applications*. *Great Britain. Meteorological Research Committee, M.R.P.*, No. 869, July 1, 1954. 14 p. 8 figs., 6 tables, 8 refs., 20 eqs. **Mimeo.** **DWB**—Standard vector deviation (S.V.D.) σ of wind between friction layer and 300 mb outside tropics is expressed as $\sigma(\text{kt}) = 0.064 s \csc \phi$, where s is S.D. of contour height (ft). Above 300 mb constant decreases to 0.033 at 100 mb. This formula and S.D. of surface pressure are used to construct world maps of S.V.D. of wind above friction layer in Jan., April, July and Oct. Estimated S.V.D. at 300 mb Northern Hemisphere, is shown for Jan.

and at 500 mb over Atlantic (from S.D. of 500 mb height) for Jan., April, July and Oct. *Subject Heading: 1. Upper air wind variations.—C.E.P.B.*

6.5-204

551.557.31

Johnson, D. H., *Tidal oscillations of the lower stratosphere*. *Royal Meteorological Society, Quarterly Journal*, 81(347):1-8, Jan. 1955. 5 figs., 5 tables, 4 refs., 4 eqs. **DWB**—Changes of W. and S. components of 100 mb winds in each month over British Isles in 6 hr periods between 3, 9, 15 and 21 h are tabulated for 1950-51 and compared with observations at 150 mb in 1944-47. Results, statistically significant, show diurnal and semidiurnal oscillations represented by

$$\begin{aligned} 100 \text{ S(kt)} &= -54 \cos(\theta + 32^\circ) + 67 \cos(2\theta + 44^\circ) \\ 100 \text{ W(kt)} &= 51 \cos(\theta + 84^\circ) + 51 \cos(2\theta - 29^\circ) \end{aligned}$$

These are related to diurnal and semidiurnal pressure variations and solar tides. *Subject Headings: 1. Upper air wind variations 2. Upper atmospheric tides.—C.E.P.B.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY AND EVAPORATION

See also: Error in psychrometer theory (Schiess), 6.5-39; *Heat diffusion* (Tverskaia), 6.5-114; *Air mass transform . . .* (Laikman, Iudin), 6.5-155; *Energy balance* (Neumann, Rosenan), 6.5-164.

6.5-205

551.571.7:551.511

Benton, George S. and Estoque, Mariano A., *Water-vapor transfer over the North American continent*. *Journal of Meteorology*, 11(6):462-477, Dec. 1954. 21 figs., 2 tables, 12 refs., 9 eqs. **DWB**—Water-vapor transfer in 1949 was computed at 850, 700 and 500 mb for 30 radiosonde stations from mixing ratio and geostrophic winds, and integrated graphically 400 mb to surface for each month. Results are shown as maps for year, winter and summer, and as zonal and meridional sections. The net inflow of water vapor across boundaries is computed, showing net inflow in winter, spring and autumn and outflow in summer; inflow for year 721×10^8 g/sec. Integrated flow maps are shown also for Jan. (deep trough), Nov. (inflow from G. of Mexico, excess precipitation) and Aug. (extreme summer conditions). Annual transport by eddies is estimated. Water balance of North America is calculated as annual march of evapotranspiration and precipitation. *Subject Headings: 1. Water vapor transport 2. North America.—C.E.P.B.*

6.5-206

551.573:63

581.116

551.508.79:631.622

Hesse, W., *Ergebnisse von Pflanzentranspirationmessungen mit Kleinlysimetern im Zusammenhang mit meteorologischen Einflüssen*. [Results of plant transpiration measurements with small lysimeters in relation to meteorological influences.] *Angewandte Meteorologie*, 2(3):65-82, Nov. 1954. 20 figs., 6 tables, 8 refs. **MH-BH**—The Hesse small lysimeter and its use are illustrated. Frequent transpiration measurements in various crops near Leipzig in 1950 growing season with and without fertilizers are described and shown in graphs with associated temperature, humidity, evaporation, light intensity, cloud, precipitation and wind speed at 0.5 and 2 m. These show clearly the influence of weather on transpiration and plant physiology. The data enable the optimum water need of different plant varieties to be determined for different fertilizers and soils, thereby economising water. *Subject Headings: 1. Transpiration 2. Transpiration recorders.—C.E.P.B.*

6.5-207

551.573

McCloud, D. E. and Dunavin, L. S., Jr., *Agrohydrologic balance studies at Gainesville, Florida*. *Johns Hopkins Univ. Laboratory of Climatology, Publications in Climatology*, 7(1):55-68, 1954. 13 figs., 2 tables, refs. **DWB**—Weekly data for temperature, precipitation, humidity, evaporation (water tank, atmometer, soil) and evapotranspiration (Bahia-grass,

white clover, corn, tobacco) are given for 1952 and 1953. None of the tested formulas (Thornthwaite, Blaney-Griddle, Tabor, Penman) gave a satisfactory result; the actual evapotranspiration being constantly higher, especially for the development period of each crop. An exponential evaluation with temperature as the argument was fitted to the observations, accounting for over 80% of the water losses. *Subject Headings: 1. Evapotranspiration 2. Evaporation from soil 3. Gainesville, Fla.—A.A.*

6.5-208

551.573:551.551

Payne, L. E., A note on a paper by Davies and Walters on "The effect of finite width of sea on the rate of evaporation into a turbulent atmosphere." *Quarterly Journal of Mechanics and Applied Mathematics*, 7(3):283-286, Sept. 1954. 3 refs., 13 eqs. DWB—The integral solution given by D. R. DAVIES and S. T. WALTERS for concentration of water vapor above a rectangular area (see item 3.5-227, May 1952, MAB) is transformed into a rapidly converging series more suitable for computation. *Subject Headings: 1. Evaporation theory 2. Atmospheric turbulence. I. Davies, D. R. II. Walters, S. T.—C.E.P.B.*

6.5-209

551.573

Ramage, C. S., Evapotranspiration measurements made in Hong-Kong. First report, Oct. 1951 to May 1953. *Johns Hopkins University. Laboratory of Climatology*, 7(1):112-124, 1954. 4 figs., table, 3 refs. Append. p. 118-124. DWB—Data from watered evapotranspiration tanks with watered surroundings gave a consistent disagreement with Thornthwaite's formula for potential evapotranspiration, which is explained by seasonal variations in relative humidity. Garden vegetables gave up to 2.3 times higher evapotranspiration than a grass cover. Daily values of temperature, precipitation, computed and measured evapotranspiration, as well as dew point, relative humidity, cloudiness and sunshine duration are given for Oct. 1951 to Nov. 1953. *Subject Headings: 1. Potential evapotranspiration 2. Evapotranspiration data 3. Thornthwaite's method 4. Hong-Kong.—A.A.*

6.5-210

551.573

Sanderson, Marie, Observations of potential evapotranspiration at Windsor, Ontario, 1953. *Johns Hopkins University. Laboratory of Climatology, Publications in Climatology*, 7(1):91-93, 1954. table, ref. DWB—Daily values of temperature, precipitation, computed and measured evapotranspiration (2 tanks with grass cover at 42°17'N and 82°58'W) are communicated for June to Dec. 1953. *Subject Headings: 1. Evapotranspiration data 2. Thornthwaite's method 3. Windsor, Canada.—A.A.*

6.5-211

551.573

Sanderson, Marie, Outline of memorandum of the present state of work on evaporation in Canada. [Abstract.] *I.U.G.G., Association of Scientific Hydrology, Oslo, 1948, [Transactions]*, 1:116, [n.d.] DWB—Potential evapotranspiration has been measured in Toronto since 1947. Thornthwaite's method for the computation of the hydrologic cycle tested for some 50 drainage basins. No data are given in the outline. *Subject Headings: 1. Evapotranspiration 2. Thornthwaite's method 3. Canada.—A.A.*

6.5-212

551.573

*†Schmuck, Adam, O parowaniu potencjalnym. [Potential evaporation.] *Wrocławskie Towarzystwo Naukowe, Prace*, Ser. B, No. 25, 1949. 50 p. 15 figs., tables, 63 refs. On title-page: *Acta Meteorologica et Climatologica Universitatis Wratislaviensis*. DLC—In the first part of the paper, entitled *Measurements of evaporation at Wrocław*, after having discussed the different ways of determining and methods of evaluating evaporation, the author presents the most important results of experiments, based on evaporation measurements for 3 years at Wrocław at different heights (0, 50, 200, 530, 815 cm) and in different environments (instrument shelter, under uninclosed roof and in open air). Results show that SE winds bringing dry air from the continent during the vegetative period simultaneously raise the temperature and increase evaporation. The second part, entitled *A test to determine potential evaporation in Poland*, deals with the question of the value of potential evapotranspiration in the vegetative and winter periods, its annual value and the changes of evaporation with changes of altitude.

A number of tables and graphs illustrate the text. *Subject Headings:* 1. Evaporation measurements 2. Potential evapotranspiration 3. Wrocław, Poland.—A.M.P.

6.5-213

625:631.4:551.573

Thornthwaite, C. W., **Estimating soil tractionability by climatic analysis.** *U. S. Quarterly Master Crops. Research & Development Branch, Environmental Protection Section, Report No. 167, April 1950.* 54 p. 6 figs., maps, 31 refs. DWB—The soil tractionability is estimated on the basis of Thornthwaite's well-known method of evapotranspiration calculation, assuming a soil below the wilting point as very dry and up to field capacity as dry. Up to a monthly water surplus of 5 cm the soil is moist and up to 10 cm very moist (sticking to foreign objects). Above 10 cm surplus the soil is wet and slippery. It is not clearly distinguished that water surplus (length per time) has a different dimension from soil moisture storage (length). A further classification distinguishes between permanent snow and ice surfaces deep snow, frozen moist and dry ground, continuous and discontinuous permafrost, giving also a nomogram for an objective determination of these regions. Monthly maps show soil conditions all over the United States. *Subject Headings:* 1. Soil trafficability 2. Frozen soil 3. Thornthwaite's method 4. United States.—A.A.

6.5-214

551.573

Thornthwaite, C. W., **A re-examination of the concept and measurement of potential evapotranspiration.** *Johns Hopkins Univ. Laboratory of Climatology, Publications in Climatology*, 7(1):200-209, 1954. 3 figs., 2 tables, 10 refs. DWB—Discusses the effect of humidity on the actual evaporation and transpiration, considering height and distance from the water or wet soil, the area of the evaporating surface, moisture content of the soil and albedo. Evapotranspirometers measure the potential evapotranspiration only in the case that if similar vegetation and moisture conditions prevail over a certain area which must be larger in dry climates. The concept of ideal potential evapotranspiration should not include variations in relative humidity, which is not a conservative climatic element. Even the introduction of the daily temperature variation, according to HALSTEAD, should be avoided as a hidden consideration of relative humidity. *Subject Headings:* 1. Potential evapotranspiration 2. Relative humidity 3. Evaporation 4. Thornthwaite's method.—A.A.

CONDENSATION

See also: Nuclei count (Würfel), 6.5-99.

6.5-215

551.574.1

Birstein, S. J. and Anderson, C. E., **The mechanism of atmospheric ice formation.** Pt. 1. **The chemical composition of nucleating agents.** *Journal of Meteorology*, 12(1):68-73, Feb. 1955. 4 figs., 2 tables, 24 refs. DWB—Summary of researches at Air Force Cambridge Research Center. Nuclei of numerous substances were prepared by heating in nitrogen and passed into a cryostat. A cloud was produced in the cloud chamber and tested for ice formation. Several substances previously reported as ice nuclei, including some iodides, were ineffective in a nitrogen atmosphere, probably because of inhibition of oxidation. Iodides of silver, lead, sodium, potassium and tin, and silver sulfide, all remained effective. Sprays of salt solutions were ineffective. Mechanism of initiation of ice formation is discussed. *Subject Heading:* 1. Freezing nuclei.—C.E.P.B.

6.5-216

551.574.1

†Junge, Christian, **The size distribution and aging of natural aerosols as determined from electrical and optical data.** *Journal of Meteorology*, 12(1):13-25, Feb. 1955. 9 figs., 8 tables, 31 refs., 16 eqs. DWB—The article deals mainly with the size distribution of Aitken nuclei, radius below 10^{-6} cm. This is calculated from mobility measurements on charged particles, corrected to nuclei spectra by a theoretical expression for the ratio of aerosol particles to charged particles. A number of ion spectra previously found are then converted into nuclei spectra and model distributions deduced. A world-wide relation between aerosol concentration and mean particle radius is derived, and explained by the coagulation of natural aerosols. The

dependence of haze scattering on wave length is calculated from the known law of distribution of particles of radius $>10^{-5}$ cm, $dN/d(\log \gamma) = \text{const.} \times \gamma^{-3}$. *Subject Headings:* 1. Aitken nuclei 2. Condensation nuclei.—C.E.P.B.

6.5-217

551.574.1:061.3

Mason, B. J., **Physics of cloud and precipitation.** *Nature*, London, 174(4438):957-959, Nov. 20, 1954. DWB—Account of Symposium at Zurich Oct. 4-6, 1954. Contributions summarized include M. DESSENS on theories of cloud nucleation tested experimentally. B. J. MASON on physics of natural precipitation, E. M. FOURNIER D'ALBE on hygroscopic nuclei in Pakistan, O. VITTORI on microchemical tests, C.-G. ROSSBY on analysis of rainwater in Sweden, W. RAU on spectrum of freezing nuclei, G. SOULAGE on residues of evaporated ice crystals, and H. BYERS, F. H. LUDLAM, R. J. MURGATROYD, V. SCHAEFER, E. BOLLAY (cloud seeding), B. J. MASON and FOURNIER D'ALBE in a discussion on cloud physics. *Subject Headings:* 1. Cloud physics 2. Symposia.—C.E.P.B.

6.5-218

551.574.1:551.578.41

Mason, B. J. and McDonald, James E., **Homogeneous nucleation of supercooled droplets.** *Journal of Meteorology*, 11(6):514-516, Dec. 1954. 4 refs. DWB—MASON discusses criticisms by McDONALD (see item 5.6-204, June 1954, MAB) of paper by MASON (see item 3.4-188, April 1952, MAB) and points out that when all refinements are incorporated, "theory predicts that the nucleation rate should increase about five-fold for every degree Celsius fall in temperature." McDONALD points to residual disagreements. *Subject Heading:* 1. Snow crystal formation.—C.E.P.B.

6.5-219

551.574.1:551.521.1

Mrose, Helmut, **Bildung von Kondensationskernen im Sonnenlicht.** [Formation of condensation nuclei in sunlight.] *Angewandte Meteorologie*, 2(3):82-86, Nov. 1954. 7 refs. MH-BH—It is known that short-wave UV light forms condensation nuclei in nuclei-free air, and that in the free air in summer nuclei count is highest at midday especially on clear days. Author found that these nuclei are not liberated from the ground. He accordingly subjected various gases including outside air and combustion gases to solar radiation in a nuclei counter with a quartz window. He observed the formation of short-lived nuclei especially in albumen products containing sulfur and in combustion products. *Subject Headings:* 1. Condensation nuclei 2. Solar radiation effects.—C.E.P.B.

6.5-220

551.574.1

Priestley, C. H. B., **The physics of rainclouds.** *Royal Meteorological Society, Quarterly Journal*, 81(347):97, Jan. 1955. 3 refs. DWB—Referring to review by Browne, I. C. and others on **The physics of rainclouds** (see item 5.11-26, Nov. 1954, MAB), PRIESTLEY calls attention to recent work of P. SQUIRES (see item 4.2-187, Feb. 1953, MAB) on the initial stage of growth by condensation on a range of nucleus sizes. *Subject Headings:* 1. Condensation nuclei. I. Browne, I. C. II. Squires, P.—C.E.P.B.

6.5-221

551.574.1

Reitan, Clayton H. and Braham, Roscoe R., Jr., **Observations of salt nuclei over the midwestern United States.** *Journal of Meteorology*, 11(6):503-506, Dec. 1954. fig., 11 refs. DWB—Observations with an impactor and a sodium flame counter at 47 ft on a tower near Champaign, Illinois, are described. Results are shown as frequency distribution of particles above 10μ . Seasonal variation was small. There was a tendency for a minimum about 8 h and maximum in afternoon, also higher counts with low unstable clouds and high wind speeds. It is concluded that particles come from local sources and are insufficient to initiate precipitation without a chain reaction. *Subject Heading:* 1. Saline nuclei.—C.E.P.B.

6.5-222

551.574.1:536

Siegert, A. J. F. (*Inst. for Advanced Study, Princeton, N. J.*), **On the theory of condensation.** *Physical Review*, 96(2):243-249, Oct. 15, 1954. 15 refs., eqs. DLC—In an attempt to understand why approximations of the van der Waals type can yield semiquantitative results

in spite of being qualitatively wrong, we have assumed that the partition function for sub-macroscopic volumes, as a function of the number of particles, is of the van der Waals type. We have considered, as a model of a real fluid, a cubic array of submacroscopic cells with variable number of particles and have assumed an interaction energy between adjacent cells only. Since the van der Waals equation predicts two sharp peaks in the probability function for the occupation numbers, one has then essentially a three-dimensional Ising model. Using some of the known properties of the Ising model (and some which can be safely anticipated) we find that with plausible assumptions about the interaction energy between cells this model exhibits condensation, and that its condensation pressure, its isotherm in the stable states, and its critical temperature, are still essentially determined by those of the individual cell. *Subject Headings: 1. Condensation processes 2. Thermodynamics.—Author's abstract.*

6.5-223

551.574.1

Twomey, S., **The distribution of sea-salt nuclei in air over land.** *Journal of Meteorology*, 12(1):81-86, Feb. 1955. 9 figs., 6 refs. DWB—Slides were exposed on an aircraft over S.E. Australia following S.W. maritime air inland. Sections are shown. Results very variable and no close correlation with mixing ratio or time over land. In an air stream undisturbed by precipitation or convective cloud formation the nuclei population was carried inland without appreciable reduction but became more uniform with height. Precipitation removed salt nuclei. Convective cloud formation and subsidence caused discontinuities. *Subject Heading: 1. Saline nuclei.—C.E.P.B.*

6.5-224

551.574.1

Wakeshima, Hiromu (*Kobe Univ. of Mercantile Marine*), **Fog formation due to self-nucleation, Pts. 1 and 2.** *Physical Society of Japan, Journal*, 9(3):400-413, May/June 1954. refs., eqs. DWB—Discussing the fog formation in adiabatically expanded dust-and-ion-free moist air, the relation between the droplet size, the time required for the growth of droplets and the rate of self-nucleation are derived, based on the assumption of a simple model process. These relations, when applied to the case of adiabatic expansion at the so-called cloud limit, give a plausible order of magnitude for these quantities. In particular, the discrepancy between the current theory of self-nucleation and the known critical expansion ratio 1.37 can be eliminated. *Subject Headings: 1. Fog formation 2. Fog nucleation.—Author's abstract.*

6.5-225

551.574.42

Thierry, P. and Fontaine, P., **Givrage remarquable observé dans la Seine-et-Marne en janvier 1953.** [Remarkable hoar frost observed in the Seine-et-Marne Department in Jan. 1953.] *La Météorologie*, Paris, 4th Ser., No. 31:213-217, July/Sept. 1953. 3 figs. French, English and Italian summaries p. 213. MH-BH—The author described an unusually intense and persistent (about 24 hours) formation of hoar frost and analyzes the accompanying synoptic situations. *Subject Headings: 1. Hoar frost intensity 2. Hoar frost formation 3. Seine-et-Marne, France.—I.L.D.*

FOG

See also: Beaver report, 6.5-90; London smog, 6.5-91; Visibility in fog (Koomen, Dunkel-man), 6.5-317.

6.5-226

551.575:551.551:551.588.6

Kuroiwa, Daisuke, **The turbulence diffusion of fog water near the ground and the fog-preventing effect of an artificial model forest.** (In: Sapporo, Japan. Hokkaido University. Institute of Low Temperature Science, *Studies on fogs in relation to fog-preventing forest*. 1953. p. 279-302. 10 figs., 2 tables, 7 refs., 16 eqs.) MH-BH—The mechanism involved in the disappearance of advective fog by the action of temperature and the capturing of fog particles by the ground under the action of gravity and turbulence is analyzed by setting up partial differential equations describing the stationary distribution of fog density, total water content in unit volume of foggy air and the air temperature. These equations are solved to determine the effect of gravity, the effect of diffusion by turbulence alone and by the com-

ination of diffusion and gravity and for the effect of temperature. The predominant effect in the vanishing of advective fog is due to the atmospheric turbulence since the coefficient of diffusion, which is contained both in the diffusion equation for fog water content and in that for atmospheric heat conduction is a function of atmospheric turbulence. The problem of designing the most effective forest for fog prevention is analyzed theoretically. *Subject Headings: 1. Fog prevention 2. Forest influences 3. Atmospheric turbulence 4. Turbulent diffusion.—I.L.D.*

6.5-227 551.575:656.08
Ricker, Edmund R., **Fog on the New Jersey Turnpike.** *Traffic Quarterly*, N. Y., 7(3): 380-385, July 1953. **DLC**—Many accidents during 1952 on the New Jersey Turnpike were attributed to fog in certain low-lying spots along the coastal plain, or where industrial pollution increased fog incidence. Studies of such accidents, and of means of reducing their frequency, were made and every predictable device tried out. Meteorological studies indicated that 1952 was not an exceptionally bad year for fog and visibility conditions on various sections of the turnpike, and an automatic warning system which will be effective when conditions exceed certain predetermined limits, will be inaugurated as soon as possible. *Subject Headings: 1. Fog warning systems 2. Traffic accidents 3. New Jersey Turnpike 4. New Jersey.—M.R.*

6.5-228 551.575.1:656.6
Rodewald, Martin, **Die Wechselsicht und ihre Gefahren.** [Changing visibility and its dangers.] *Wetterlotse*, No. 79:233-242, Nov. 1954. **fig. DLC**—Accidents at sea are often due to changes of visibility in space or time; e.g., loss of the "Maipu" off the Elbe in Nov. 1951 was due to land fog advancing over sea. A similar case caused a collision on Nov. 27, 1952. An example of visibility changing in time on July 25, 1954 is described with chart; fog developed off Scilly Islands in Tm air advancing over cold water. *Subject Headings: 1. Fog formation 2. Marine disasters.—C.E.P.B.*

CLOUDS

See also: Haze clouds (Volz), 6.5-97; "Warm" showers (Atlas), 6.5-235.

6.5-229 551.576:551.507.352
Malkus, Joanne Starr, **Cumulus cloud observations: methods, instrumentation, flight procedures, reduction and analysis of data.** Woods Hole Oceanographic Institution, Contract 60nrr-27702, Project NR-082-021, Technical Report, No. 32, Aug. 1954. 20 p. 9 figs. (incl. photos), 11 refs. **DWB**—The use of the PBV-6A aircraft in cumulus cloud observations is discussed in detail. The calibration of the aircraft for vertical draft measurements is reviewed and its applicability to cloud penetrations established. The equation of draft calculation from oscillograph records of accelerations, pitch, airspeed, and altitude is set forth and its use with the actual records outlined. The other measurements made in cloud flights, including temperature, water vapor, liquid water, small-scale turbulence, and those by photography, are described, along with the instrumentation employed. An estimate of the instrumental lags and errors is given where possible. The cloud-flight procedures, stating the role of each observer and the method of flying are outlined, and the steps in the reduction and analysis of the data presented, including the reconstruction of the final cloud cross sections with the aid of photographs. It is shown why the PBV is probably the only satisfactory aircraft for this type of meteorological work. *Subject Headings: 1. Cumulus cloud observations 2. Cumulus cloud data 3. Airplane observations.—Author's abstract.*

6.5-230 551.576.1:779
Bečvář, A. and Šimák, B., **Atlas horských mraků.** *Atlas nubium Skalnate Pleso.* [Cloud atlas, Skalnate Pleso.] Prague, Přírodovědecké Vydávatelství, 1953. 45 p.+160 photos of clouds (many in color). Glossary in Czech, Russian, French and German p. 43 45. 7 refs. **DWB**—The plates are either half tones or color photographs. All the cloud types illustrated were photographed at Skalnate Pleso and the date, hour and wind direction for each photograph

are given in Czech, French, German and Russian. *Subject Headings:* 1. Cloud atlases 2. Cloud photographs 3. Skalnate Pleso, Czechoslovakia.—*I.L.D.*

6.5-231

551.576.11

Malkus, Joanne Starr and Scorer, R. S., **The erosion of cumulus towers.** *Journal of Meteorology*, 12(1):43-57, Feb. 1955. 10 figs., 4 tables, 15 refs., 25 eqs. DWB—To introduce time dependence into the model of an entraining updraft, a differential equation is formulated for the rate of rise of an individual bubble. From this and a law for the erosion, or rate decrease in size, of a bubble, an erosion parameter E is derived, given by

$$G = \frac{3}{2}E^{-\frac{1}{2}} = (-t)^{\frac{1}{2}}gB\left(1 - \frac{w}{gB}\right)^{\frac{1}{2}}w,$$

where w is ascent velocity and B is percentage excess density of outside air over that of bubble. Observations with time-lapse films in trade wind regions and middle latitudes of bubbles from 100 m to 1 km diameter are tabulated. They show that E is nearly constant, and applies also to aggregates of bubbles, average values of G being 0.19 to 0.21. Finally interaction of bubbles with one another and with environment to form large cumulus is discussed. *Subject Headings:* 1. Cumulus cloud formation.—*C.E.P.B.*

6.5-232

551.576.11

Woodley, K. E., **Patterns in very thin stratus.** *Meteorological Magazine*, London, 84(991):25-27, Jan. 1955. 2 figs., plate, ref. DWB—A sketch of stratus over Surrey on April 21, 1954, shows an inverted ridge formed by descent of part of a cloud, and two ribbed lanes (one formed by aircraft). Relations to wind structure are considered. *Subject Headings:* 1. Cloud structure.—*C.E.P.B.*

PRECIPITATION

See also: **Thunderstorms** (Ambrosetti), 6.5-133; **Fronts** (Oliver, Holzworth), 6.5-135; **Precipitation effects** (Wexler), 6.5-136.

6.5-233

551.577:551.501.45

Szesztay, Károly, **Statistikai eljárás az inhomogén csapadékadatok egyenművé tételére.** [A statistical method for adjusting heterogeneous precipitation data.] *Időjárás*, 58(2):96-102, March/April 1954. 3 figs., 2 tables, 6 refs. Russian and English summaries p. 96. MH-BH—Homogeneity of precipitation data is frequently impaired by changes in the surroundings of a station or in observation techniques. The paper gives a review of double-mass analysis on the basis of literature and of author's experiences gained while introducing this method into Hungarian hydrologic practice. *Subject Headings:* 1. Precipitation data analysis 2. Precipitation calculations 3. Hungary.—*Author's abstract.*

6.5-234

551.577.1:551.577.2

Schirmer, H., **Schauer bevorzugen bestimmte "Strassen."** [Showers favor certain "streets."] *Umschau*, 54(3):74-75, Feb. 1, 1954. 3 figs. DWB—Summer showers falling from source-clouds give rain in streaks which appear on daily charts of rainfall. In monthly charts the tracks tend to form groups. The amount of rain released is also a function of orography, and the annual average map combines the two factors. *Subject Heading:* 1. Precipitation distribution.—*C.E.P.B.*

6.5-235

551.577.11:551.576.1

Atlas, David, **Observations of "warm" showers in Ohio.** *Journal of Meteorology*, 11(3):254-256, June 1954. 2 figs., 2 tables, 4 refs. MH-BH—Evidence by L. J. BATTAN (see item 5.3-257, March 1954, *MAB*) is strengthened by 3 cm radar observations of rainstorms. Many of these showed echo tops entirely below 0°C level, the proportion decreasing with distance and therefore with height. *Subject Headings:* 1. Precipitation formation 2. Cumulus clouds 3. Radar rainfall measurement.—*C.E.P.B.*

6.5-236

551.577.2(54)

*Bakthavathsalu, C. M. and Balasubramaniyan, C. (*Agric. Coll. and Res. Inst., Coimbatore*), **Confidence limits of expected monthly rainfall for the Agricultural College and Research Institute, Coimbatore.** *Indian Journal of Meteorology and Geophysics*, 4(3):249-252, July 1953. 3 figs., 3 tables, 8 refs. **MH-BH**—Monthly rainfall data for Coimbatore, India, for 43 years (1908-1951) are analyzed statistically to show the confidence limits (9 years out of 10) that would be expected for agricultural purposes in different months. Since the rainfall distribution are skewed the data were transformed by KLECZKOWSKI's formula to make the distribution near normal so confidence limits could be set by conventional methods. This was done and results given in graphs, histograms and tables. *Subject Headings*: 1. Rainfall confidence limits 2. Skewed rainfall distributions 3. Coimbatore, India.—*M.R.*

6.5-237

551.577.2(42):551.577.3

Gregory, S., **Annual rainfall areas of southern England.** *Royal Meteorological Society, Quarterly Journal*, 80(346):610-618, Oct. 1954. 5 figs., 7 refs. **DWB**—England S of line Bristol Channel-Wash is divided into 5 areas by shape of curve of 10-year running totals of annual rainfall 1900-50. Some further regional characteristics are illustrated by distribution of years of exceptionally high or low rainfall. *Subject Headings*: 1. Precipitation variations 2. Southern England.—*C.E.P.B.*

6.5-238

551.577.2(54)

*Sinha, K. L. (*Indian Regional Met. Center, N. Delhi*), **An analysis of the space distribution of rainfall in India and Pakistan.** *Indian Journal of Meteorology and Geophysics*, Delhi, 3(1):1-16, Jan. 1952. fig., table. **DWB**—Statistics have been compiled for the meteorological subdivision of pre-partition India from two year's data (1936-1939) in order to obtain an idea of the number of occasions of the different types of rainfall distribution (widespread, local and few falls) in different parts of the country. Tables are given showing for each division the average number of days of widespread, local and few falls together with the highest and lowest number of days for each category. The total number of days of rainfall and the number of days of widespread rainfall for each meteorological subdivision in the different month of the year are discussed. In respect to the number of days of rainfall some divisions have one peak while others have two peaks. The peak common to all divisions is due to the north-west monsoon, the other peak is due to the western disturbances. The peak observed during the month of active western disturbances is noticeable in the south up to the Madras Deccan so that the secondary and tertiary effects of the western disturbances may extend as far south as the Madras Deccan. *Subject Headings*: 1. Rainfall distribution 2. India 3. Pakistan.—*From author's abstract.*

6.5-239

551.577.3(410)

Glasspoole, John, **Rainfall over Great Britain and Northern Ireland during 1953.** *Water and Water Engineering*, 58(696):71-73, Feb. 1954. 3 tables. **DGS**—Annual and monthly totals averaged over England and Wales, Scotland, and Northern Ireland, are set out, compared with normal values and discussed. Values are also given for Oct. 1952-March 1953 and April-Sept. 1953. The winter half-year was dry and the summer wet. *Subject Headings*: 1. Precipitation variations 2. British Isles.—*C.E.P.B.*

6.5-240

551.577.38:631

Basile, Robert M., **Drought in relation to corn yield in the Northwestern corner of the corn belt.** *Agronomy Journal*, 46(1):4-7, Jan. 1954. 3 figs., 10 refs. **DLC**—The variable yields of corn in Beadle County, S. Dakota, are investigated in order to obtain a picture of the effects which droughts during the growing seasons have upon corn yields in Northwestern United States. A graphical analysis of corn yield data for the interval 1925-1950 shows that the drought periods reduce yield for drought year and in some cases also for the following year. The fact that yields do not decline during the wettest of the wet years is attributed to the non-attainment of the optimum moisture conditions for corn. *Subject Headings*: 1. Drought effects on crop yield 2. Corn yield 3. Agricultural climatology 4. Northwestern United States.—*I.L.D.*

6.5-241

551.577.5

Trimble, G. R. and Weitzman, Sidney (*Northeastern Forest Experiment Station, Forest Service, U. S. Dept. of Agric., Upper Darby, Penna.*), **Effect of a hardwood forest canopy on rainfall intensities.** *American Geophysical Union, Transactions*, 35(2):226-234, April 1954. 4 figs., 5 tables, refs. **MH-BH**—Ground rainfall intensities and throughfall were measured under a fully-stocked hardwood forest in West Virginia over a period of one year. Maximum 5- and 15-min intensities were compared with similar measurements made in the open. The results were analyzed separately for winter and summer conditions; that is, bare canopy versus canopy in full leaf. Regression equations were calculated for estimating intensities and throughfall under canopy from rainfall measurements made in the open. The study shows that low rainfall intensities are reduced more by summer canopy, and high intensities are reduced more by winter canopy. Throughfall is reduced by canopy interception approximately the same amount in both summer and winter. *Subject Headings: 1. Rainfall intensities 2. Forest influences 3. Precipitation interception 4. West Virginia.—Authors' abstract.*

6.5-242

551.577.3:551.553.11(759)

Gentry, Robert C. and Moore, Paul L., **Relation of local and general wind interaction near the sea coast to time and location of air-mass showers.** *Journal of Meteorology*, 11(6):507-511, Dec. 1954. 4 figs., 3 tables, 4 refs. **DWB**—The pattern of scattered summer showers near SE coast of Florida is related to the interaction of the general wind with local winds, mainly sea breezes. Diurnal variations of rainfall frequencies at Miami, Hialeah and Pensuoco for winds of different directions are tabulated. A cross section normal to coast on a sea breeze afternoon is drawn. Applications to forecasting are suggested. *Subject Headings: 1. Land and sea breezes 2. Rainfall variations 3. Florida.—C.E.P.B.*

6.5-243

551.577.37:551.579.4(778)

†Lott, George A., **The world-record 42-minute Holt, Missouri, rainstorm.** *Monthly Weather Review*, 82(2):50-59, Feb. 1954. 13 figs., 4 refs. **DWB**—On June 22, 1947, 12 inches of rain fell in 42 minutes at Holt, Missouri, setting a world's record for intensity of that duration. Added to the generally heavy rains of the month, the wettest on record (1888-1947) in N Missouri, the storm caused major local floods and a disastrous flood at St. Louis, on July 2 (greatest since 1844). Surface and upper air synoptic conditions are reviewed and illustrated. Bucket observations in NW Missouri, shown on isohyetal chart, indicate that 11" fell over 10 sq mi, 8" over 100 sq mi, 5.25" over 1000 sq mi and 4" over 4000 sq mi. Hourly synoptic charts with 1 mb interval show closed low system of small dimensions moving from around Topeka, over the area, with very cold air to the NW (caused by local cooling in thundershower), a long narrow tongue of warm moist air gave the moisture supply and convective system ahead of cold front. *Subject Headings: 1. Record rainstorms 2. Synoptic studies 3. Floods 4. Excessive rainfall 5. Holt, Mo.—M.R.*

6.5-244

551.577.37/8:001

Richardson, W. E., **Definition of dry and wet periods.** *Meteorological Magazine*, London, 83(990):375-377, Dec. 1954. **DWB**—Official definitions of droughts, wet spells and rain spells in Britain are criticized and additional definitions proposed for Partial dry spell, Partial rain spell and Partial wet spell. *Subject Headings: 1. Definitions 2. Drought 3. Rainfall frequencies.—C.E.P.B.*

6.5-245

551.577.38(94)

Bond, H. G., **The 1951-2 drought in Northern Territory, Australia.** *Weather*, 10(1):3-12, Jan. 1955. 7 figs. **DWB**—Drought of summer 1951-2 is illustrated by comparing maps of rainfall departure Oct.-March 1951-2 and 1952-3. Barkly Tableland, NE interior, had a deficit of over 20 in. in 1951-2, causing heavy cattle losses; here drought did not break till Feb. 1953. Drought was due to failure of NW monsoon and low incidence of depressions; ITZ lay abnormally far north in association with a weak pressure gradient Singapore-Darwin. Middle latitude anticyclones also passed in unusually low latitudes. *Subject Headings: 1. Drought 2. Northern Territory, Australia.—C.E.P.B.*

RAIN

See also: **Radioactive dust** (Chatterjee, others), 6.5-339.

6.5-246

551.578.11

Blanchard, Duncan C. and Magono, Choji, Comments on "On the shape of water drops falling in stagnant air." *Journal of Meteorology*, 12(1):91-93, Feb. 1955. fig., table, 9 refs. DWB—BLANCHARD points out that MAGONO's terminal velocities (see item 5.9-239, Sept. 1954, MAB) are considerably lower than those found by J. O. LAWS and by R. GUNN and G. D. KINZER and discusses the discrepancies. MAGONO agrees that his tunnel may not have been high enough but regards the questions referring to raindrop shapes as still open. *Subject Headings: 1. Raindrop shapes 2. Raindrop velocity.—C.E.P.B.*

6.5-247

551.578.11:629.13

Brun, Rinaldo J. and Dorsch, Robert G. (*Lewis Flight Propulsion Lab., Cleveland, Ohio*), Impingement of water droplets on an ellipsoid with fineness ratio 10 in axisymmetric flow. U. S. NACA, Technical Note, No. 3147, May 1954. 37 p. 10 diagrs., table. DWB—The presence of radomes and instruments that are sensitive to water films or ice formations in the nose section of all-weather aircraft and missiles necessitates a knowledge of the droplet impingement characteristics of bodies of revolution. Because it is possible to approximate many of these bodies with an ellipsoid of revolution, droplet trajectories about an ellipsoid of revolution with a fineness ratio of 10 were computed for incompressible axisymmetric air flow. From the computed droplet trajectories, the following impingement characteristics of the ellipsoid surface were obtained and are presented in terms of dimensionless parameters: 1) total rate of water impingement, 2) extent of droplet impingement zone, and 3) local rate of water impingement. These impingement characteristics are compared briefly with those for an ellipsoid of revolution with a fineness ratio of 5 reported in NACA TN 3099. *Subject Headings: 1. Drop impingement on ellipsoids 2. Icing of aircraft.—NACA abstract.*

6.5-248

551.578.11:629.13

Dorsch, Robert G.; Brun, Rinaldo J. and Gregg, John L., Impingement of water droplets on an ellipsoid with fineness ratio 5 in axisymmetric flow. U. S. NACA, Technical Note, No. 3099, March 1954. 50 p. diagrs., table. DWB—The presence of radomes and instruments that are sensitive to water films or ice formations in the nose section of all-weather aircraft and missiles necessitates a knowledge of the droplet impingement characteristics of bodies of revolution. Because it is possible to approximate many of these bodies with an ellipsoid of revolution, droplet trajectories about an ellipsoid of revolution with a fineness ratio of 5 were computed for incompressible axisymmetric air flow. From the computed droplet trajectories, the following impingement characteristics of the ellipsoid surface were obtained and are presented in terms of dimensionless parameters: (1) total rate of water impingement, (2) extent of droplet impingement zone, (3) distribution of impinging water, and (4) local rate of water impingement.—*Subject Headings: 1. Impingement of drops 2. Drop impingement on ellipsoids.—NACA abstract.*

6.5-249

551.578.11

Dean, Lawrence A.; Jones, Douglas M. A. and Atlas, David, Drop-size history during a shower. *Journal of Meteorology*, 11(3):256-257, June 1954. fig., 5 refs. MH-BH—Referring to paper by D. ATLAS and V. G. PLANK (see item 5.6-227, June 1954, MAB), DEAN and JONES show two different drop-size spectra, indicating that c and k in expression $Z = cR^k$ differ from storm to storm. ATLAS suggests that variation of k is small and is given by $6/(3+b)$ where b is given by relation between velocity and drop diameter, $v = ad^b$. *Subject Heading: 1. Raindrop sizes.—C.E.P.B.*

6.5-250

551.578.11:581.5

Hapsten, Ulf, Regndråper som sprednings-agens. Nyere oppdagelser innen sprednings-økologien. [Raindrops as distribution agents. Recent discoveries from ecology.] *Naturen*, 78(2):48-56, 1954. 4 figs. DLC—H. J. BRODIC's discoveries of plant and fungus distribution by means of the kinetic energy of falling raindrops are discussed. Laboratory experiments

showed that the angle 60-70° in relation to the horizontal plane gave better discharge effect of raindrop water. Shape and angle of inclination of plants adapted for the raindrop effect show the perfect mechanism of "nature's splash guns." *Subject Headings: 1. Raindrop distribution 2. Drop shattering 3. Vegetation influences.—W.N.*

6.5-251

551.578.11

McDonald, James E., **The shape and aerodynamics of large raindrops.** *Journal of Meteorology*, 11(6):478-494, Dec. 1954. 6 figs., 3 tables, 29 refs., 11 eqs. DWB—For falling spherical drops of 0.01-0.5 cm radius forces due to surface tension and hydrostatic pressure are determined. Electrostatic charges are negligible except possibly in thunderstorms. Internal circulation in the drop is negligible. Distribution of aerodynamic surface pressures is calculated from side photographs of drops. Results of 16 analyses are shown in profiles. The total vertical forces agree reasonably with drop weight. For raindrops of radius 1 mm or more there is evidence of separation of airflow on either side with eddies behind falling drop which are shed periodically. Calculated profiles agree with those observed. *Subject Heading: 1. Raindrop shapes.—C.E.P.B.*

6.5-252

551.578.11

†Rigby, E. Caroline; Gunn, K. L. S. and Hitschfeld, Walter, **Development during fall of raindrop size distributions.** McGill Univ. Macdonald Physics Laboratory. Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report MW-17, Jan. 1954. 35 p. 12 figs., table, 14 refs. DWB—Statistical study of changes in raindrop size distributions and in the resulting radar echo in falling, due to collisions, evaporation and breakup. Both continuous rain and showery rain types are analyzed. Vertical motion of radar echoes and appearance on radar screen also considered. Appendix consists of a theoretical and empirical study of depletion of cloud through accretion by falling rain. Numerous detailed and carefully drawn graphs of distributions and related parameters are presented. *Subject Headings: 1. Cloud physics 2. Raindrop size distribution 3. Radar precipitation echoes.—M.R.*

SNOW

See also: **Forecasting snowfall** (Richards), 6.5-77; **Atmos. cooling** (Wexler, others), 6.5-138; **Supercooled droplets** (Mason, McDonald), 6.5-218; **Radioactivity in atmos.** (Carrigie), 6.5-341.

6.5-253

551.578.41

Mason, B. J. and Shaw, D., **The effect of temperature and supersaturation on the growth habit of ice crystals.** *Journal of Meteorology*, 12(1):93-94, Feb. 1955. 4 refs. DWB—Discusses reasons for the changes of ice-crystal form plates-prisms-plates-prisms as temperature is lowered from 0 to -30°C. Experiments show that crystal habit is mainly controlled by temperature and not by supersaturation or vapor density excess, but crystal faces have their own individual characteristics. *Subject Heading: 1. Snow crystals.—C.E.P.B.*

6.5-254

551.578.46(52)

Arakawa, H., **Three unusual depths of snowfall in Japan.** *Royal Meteorological Society, Quarterly Journal*, 81(347):99-101, Jan. 1955. fig., table. DWB—Depths of snow lying quoted are: Ibukisan, 14 Feb. 1927, 11.82 m (record for Japan), Makawa, 26 Feb. 1945, 7.50 m, and Tochiomata, 15 Feb. 1936, 7.8 m. The daily values in each of these winters are shown graphically. *Subject Headings: 1. Snow accumulation 2. Japan.—C.E.P.B.*

6.5-255

551.578.46(45)

*Dagnino, Ignazio, **Le precipitazioni nevose nel versante ligure delle Alpi e degli Appennini.** [Snow precipitation on the Ligurian slopes of the Alps and the Appenines.] *Geofisica e Meteorologia*, Genoa, 1(6):95-97, Nov./Dec. 1953. table, 2 refs. MH-BH—Snow conditions on the Italian mountain slopes reviewed. Table gives for 37 stations above 500 m elevation for period 1922-42, the mean annual number of days with snow, the relative frequency of snow days to precipitation (snow or rain) days, and the coefficient of "nevosity"

or the proportion of measured precipitation which falls as snow, and the height of station, length of record, and catchment basin. Length of period snow lays on the ground is also discussed. *Subject Headings:* 1. Snow cover data 2. Ligurian Alps, Italy.—*M.R.*

6.5-256

551.578.46:551.524.7

Diamond, Marvin and Lowry, W. P., **Correlation of density of new snow with 700-millibar temperature.** *Journal of Meteorology*, 11(6):512-513, Dec. 1954. 2 figs., 3 refs. **DWB**—Density of new snow at Central Sierra Snow Laboratory (6890 ft) has a correlation of 0.638 with 700 mb temperature at Oakland 150 mi to SW, and 0.503 with surface temperature at 6890 ft. No relation was found with 500 mb temperature. *Subject Headings:* 1. Snow density 2. Upper air temperatures.—*C.E.P.B.*

6.5-257

551.578.46

Lauscher, Friedrich, **Schneedichten in Norwegen.** [Snow densities in Norway.] *Wetter und Leben*, Vienna, 6(3/4):60-61, June 1954. table. **MH-BH**—An analysis of the date of "mean monthly and annual water equivalent of the snow" for 51 localities in Norway as presented in Nedbören; Norge 1895-1943. A table gives the normal values of snow density at different elevations for the individual months. The snow density increases from Sept. to June and with elevation above sea level. *Subject Headings:* 1. Snow density 2. Nedbören, Norway.—*I.L.D.*

6.5-258

551.578.46(410)

Snow survey of Great Britain, Session 1953/54. *Meteorological Magazine*, London, 83(990):353-359, Dec. 1954. 3 figs., ref. **DWB**—The annual snow survey previously published in the *Journal of Glaciology* has been taken over by the Meteorological Office. Season had less than average snowfall, Oct.-Dec. being especially mild. Duration of snow cover at 2500 ft 71 days (average 83); daily distribution 4000 ft-sea level is shown for 10 districts. *Subject Headings:* 1. Snow cover 2. British Isles.—*C.E.P.B.*

HYDROMETEOROLOGY

See also: Record rainstorm (Lott), 6.5-243; Radioactive snow (Meinke), 6.5-344; Sound propagation in snow (Oura), 6.5-354; Sound velocity in snow (Oura), 6.5-355.

6.5-259

551.579:631.4

Fekete, Zoltán, **Az idei hó jelentősége a talaj vízgazdálkodásában.** [Effect of this year's snow cover on the water balance of the soil.] *Időjárás*, 58(1):24-31, Jan./Feb. 1954. 6 refs. Russian and French summaries p. 24. **MH-BH**—The problem and importance of retention of snow-melt water by the soil and methods of securing it are discussed. Snow, soil and melting conditions of the winter 1953-54 are described. *Subject Headings:* 1. Agricultural hydrology 2. Water conservation 3. Snow runoff correlations 4. Hungary.—*G.T.*

6.5-260

551.579

Frolow, Vladimir and Péreau, Aimée, **Définition morphologique de la phase des composantes de l'écoulement en Italie.** [Morphological definition of the phase of the components of runoff in Italy.] *Geofisica Pura e Applicata*, 27:159-166, 1954. 3 figs., 5 refs. English and French summaries p. 159. **MH-BH**—The annual and semi-annual components of runoff of rivers in Italy, Sicily and Sardinia are calculated by the Labrouste method from river gage data for 224 stations and some of the results are shown graphically. The advance or retarding of the phase as one approaches the sea or the interior (mountains) is noted. The phase of runoff of rivers in Italy follows a straight line relationship to the annual thunderstorm regime. *Subject Headings:* 1. Runoff regime 2. Thunderstorm-runoff relationships 3. Topographic effects 4. Italy.—*M.R.*

6.5-261

551.579:06

Pardé, M., **Le "boom" récent des études hydrologiques dans la France d'outre-mer.** [The recent "boom" of hydrological studies in the French colonies.] *Grenoble. Université*.

Institut Polytechnique, Annales, 1954. p. 31-37. Abstracted from separated sheets. DWB—In 1940-41 there was little interest in the hydrology of French Africa, and no studies thereof but by 1952 or 1953 the interest was very great and the number of studies and publications increasing rapidly. These are described by regions (Algeria, Tunis and Morocco, West Central Africa, Madagascar, etc.). The official services are also described. *Subject Headings*: 1. Hydrologic studies 2. Hydrologic services 3. French Africa.—M.R.

6.5-262

551.57

†Rakhmanov, V. V., *Iskusstvennaia skhema vlogooborota*. [Artificial scheme of the moisture cycle.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 86(2):178-188, March-April 1954. 40 refs. DLC—The history of the concepts of the influence of inland evaporation upon the moisture content of the atmosphere and the relationship between the moisture cycle over the continents to that over the ocean is presented. The work of VOEIKOV, BRUCKNER, MEINARDUS, KASATKIN, K. FISCHER, A. D. DUBAKH and of others is summarized. The author presents a detailed analysis of V. V. Z. TSINZERLING's concept that a complete hydrologic cycle not within the limits of the earth surface and not within those of a river basin but within the boundaries of a natural geographic region which is termed a "complete hydrologic cycle." *Subject Headings*: 1. Hydrologic cycle. I. Tsinzerling, V. V.—I.L.D.

6.5-263

551.579.3

*Linsley, Ray K. (*Stanford Univ.*), *Some aspects of precipitation and surface stream flow in ground-water recharge*. UNESCO. *Advisory Committee on Arid Zone Research, Arid Zone Programme*, No. 2:140-150, 1953. 9 figs., 15 refs. DWB—Using the Santa Clara Valley of California as a model, the author describes and illustrates the problems of water storage from precipitation to stream flow to ground water that occur in an arid valley surrounded by mountains which receive heavy precipitation. Rainfall is about 16" a year as is also the precipitation in the surrounding ranges. A method of more accurate estimation of precipitation over a mountainous area is illustrated: the simple relation of elevation to precipitation accounts for only .55 of the variation. Considering the orientation, slope, exposure and zone of environment, a correlation index of >0.82 was obtained. Graphical method of SPREEN is illustrated. Computed maps (using SPREEN's method, give 20 or 30% more precipitation over an area than do maps drawn from gage readings only. This is explained logically. There is little recharge of ground waters from local rainfall or river bed recharge in this area—most of the recharge comes from flood flow from nearby mountains. Ground water levels amplify precipitation variations in arid zones, as greater withdrawal (as well as less recharge) occurs in dry years and vice versa. In humid regions the ground water levels respond very slowly to rainfall variations—sometimes reflecting only the average precipitation over a 25-year period. Streamflow records for 200 streams in the U.S.A. show that there has been less runoff per unit precipitation in recent years than in older times. *Subject Headings*: 1. Ground water recharge 2. Precipitation and streamflow 3. Isohyet construction 4. Topographic effects.—M.R.

6.5-264

551.579.5:551.582.2

*Mather, John R. (*Johns Hopkins Univ., Lab. of Climatology, Seabrook, N. J.*), *The determination of soil moisture from climatic data*. *American Meteorological Society, Bulletin*, 35(2):63-68, Feb. 1954. 4 figs., table, 8 refs. MH-BH—A method for computing daily values of soil moisture from climatic data is described and comparisons with measured soil moisture values are given. Because the soil moisture values are obtained from climatic data only, past values of soil moisture content, unavailable otherwise, can be determined for any place for which climatic data are available. A long record of soil moisture is computed for one locality and estimates of the probabilities of occurrence of different levels of soil moisture are made. Such estimates are essential in any realistic long range planning. *Subject Headings*: 1. Soil moisture determination.—*Author's abstract*.

6.5-265

551.579.5

Reinhart, K. G. and Taylor, R. E. (*Southern Forest Exper. Station, Vicksburg, Miss.*), *Infiltration and available water storage capacity in the soil*. *American Geophysical Union*,

Transactions, 35(5):791-795, Oct. 1954. 4 figs., table, 9 refs. **MH-BH**—Results of studies at Vicksburg, Mississippi, have emphasized the importance of antecedent available storage capacity upon infiltration rates and amounts for certain fine-textured soils. The recovery of infiltration rates after cessation of rainfall was found to be slow because of a corresponding slow rate of recovery of available storage. The value of electrical-resistance units, to follow the downward movement of water during infiltration runs and to determine the rate at which storage capacity became available after runs, was demonstrated. *Subject Headings*: 1. Infiltration 2. Ground water storage 3. Vicksburg, Miss.—*Authors' abstract*.

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

6.5-266

551.58:551.311.1

Tronov, M. V., **Problemy gliatsioklimatologii**. [Problems of glacial climatology.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 85(3):284-286, May/June 1953. **DLC**—This article contains the essentials of the report made at the session of the Department of Physical Geography of the Geographical Society on Jan. 6, 1953. The leading idea is to reinforce the study of processes important in the interrelations between glaciers and climate. The foundations of glacier-climatology have been laid by M. V. LOMONOSOV and A. I. VOEIKOV. Principally, the most important problem of glaciology and climatology could be solved by investigating the dependence of glaciation on climate and relief: $L=f(K,R)$, where L =glaciation, K =climate and R =relief. In practice this equation can hardly be solved, because of the very complex nature of all ingredients. The investigation of the interrelations existing between glaciation and climate is facilitated by the introduction of the concept of the snow line, which is connected with the position of the chionosphere level. Each thesis and sub-thesis of this report contains a separate thought, which is an individual link in the chain of knowledge presented in a very concise form. *Subject Headings*: 1. Glacial climatology 2. Climatology 3. Glaciology.—*N.T.Z.*

6.5-267

551.58:621.311

Turner, Robert E., **Effect of climate on electric utility planning and operations**. (In: Pennsylvania Electric Assoc. Hydraulic Power Committee, **Symposium on climatic trends in Northeastern United States, April 22-23, 1952**, Minutes, p. 6-16, pub. 1952. Discussion, *Ibid.*, p. 17-22. **DWB**—Many phases of activity of hydroelectric and even steam generating plants and systems depend on climate as well as weather factors. These factors can be calculated in planning installations or operations, provided the climate does not change. No predictable pattern of changes has been detected—even cyclical changes found in past records did not predict the driest year (March 1930-April 1931) or the wettest (Oct. 1932-Oct. 1933) in the history of operations on the Susquehanna (Penna.). Drought, flood, cold (ice and snow), cloudiness, heat and even winds (off-shore or on-shore) influence maintenance, output and demand. A bad long-range forecast would be worse than no forecast. Climatic statistics can give a sound basis for establishing financial reserves against adverse conditions. *Subject Headings*: 1. Applied climatology 2. Climate and electric power 3. Pennsylvania.—*M.R.*

CLIMATE OF PARTICULAR PLACES

See also: Climatic atlas of U. S. (Visher), 6.5-2; Meteorology of Falkland Islands (Pepper), 6.5-3; Climate and weather in Arosa (Götz), 6.5-4; Soil moisture (Mather), 6.5-264; Clothing climate (U. S. Quartermaster Corps), 6.5-310.

6.5-268

551.582:629.13(489)

*Denmark. Luftfartsvaesene, **Aeronautical climatology of Denmark, Pt. 1, Copenhagen Airport. Pt. 2, Aalborg Airport**. Pub. 1953. 2 pieces. 36+36 p. entirely tables. **DWB**—Reports contain extensive tabulation of frequencies of visibilities, cloud base heights, fog and winds, and combinations of these elements when occurring simultaneously, and of snow, rain,

drizzle, hail, ice, thunderstorms, temperature, relative humidity and precipitation for 1941-1948, based on 8 fixed observations a day in most cases, for Copenhagen and Aalborg airports. *Subject Headings:* 1. Aeronautical climatology 2. Airport climatic data 3. Copenhagen, Denmark 4. Aalborg Airport, Denmark.—*M.R.*

6.5-269

551.582:551.481(57)

*Sarkisian, C. G., *Baikal i istoriia ego obrazovaniia*. [Lake Baikal and the history of its formation.] *Priroda*, Moscow, 43(7):71-84, July 1954. DLC—This description of the paleogeography and contemporary physical geography contains a description of the climate of Lake Baikal. Data on air temperature near the lake and on water temperatures and description of the characteristic winds of the lake. *Subject Headings:* 1. Climate of Lake Baikal 2. Climatic data 3. Lake Baikal, U.S.S.R.—*I.L.D.*

6.5-270

551.582:551.584

Thorntwaite, C. Warren, *Topoclimatology*. (In: American Meteorological Society and Royal Meteorological Society, *Proceedings of the Toronto Meteorological Conference*, Sept. 15-17, 1953, p. 227-232, pub. 1954. 23 refs.) DWB—Topoclimatology is defined as the study of the climate of a place. It includes detailed mapping aspects of the soil that affect the heat and moisture balance, aerodynamic roughness, albedo, etc. (for abstract of preliminary version, see item 5.9-284, Sept. 1954, *MAB*.) *Subject Headings:* 1. Climatology 2. Topoclimatology.—*C.E.P.B.*

6.5-271

551.582.1(04)(410) 551.521.11(04)(410)

Manley, Gordon, *Britain's sunshine*. *Geographical Magazine*, 25(2):59-63, June 1952. 4 color plates. DWB—A chatty account of the duration, quality and effects of sunshine in different parts of Britain in different months. *Subject Headings:* 1. Sunshine 2. Popular articles 3. British Isles.—*C.E.P.B.*

6.5-272

551.582.2(55)

†*Ganji, M. H., *Contribution to the climatology of Iran*. Thesis (Ph.D.) Clark University, May 1954. 224 p. 50 maps, 10 charts, 58 tables, extensive bibliog., append. Carbon of typescript. DWB—A detailed descriptive treatment of the climate of Iran containing a considerable amount of climatic data and an extensive bibliography on the climate of Iran. The usual climatic variables and various climatic phenomena are described with the aid of maps. The air masses of Iran are discussed and the climate is classified in accordance with KÖPPEN's, DE MARTONNE's, TREWARTHA's and THORNTWHAITE's systems. *Subject Headings:* 1. Climatic data 2. Climatic classifications 3. Climate of Iran 4. Iran.—*I.L.D.*

6.5-273

551.582.2(791)

Hensley, M. Max (*Dept. of Biology, Gettysburg College, Penna.*), *Biological relations of the breeding bird population of the desert Biome in Arizona*. *Ecological Monographs*, Durham N. C., 24(2):185-207, April 1954. 5 figs., 17 tables, bibliog. p. 2-7. DLC—Only two weather stations are located near the Organ Pipe Cactus National Monument in Pima County, Ariz. (in the Sonora Desert on the Mexican border). These stations are Sonoita and Ajo. A section of the monograph is devoted to the climate (temperature, precipitation, etc.) of the area, illustrated by composite climatic graphs for Sonoita in Sonora, Mexico, and Ajo in Arizona, and table of mean monthly maximum and minimum temperatures during the period of study Aug. 1948-July 1949, and mean monthly and annual precipitation for Ajo and Organ Pipe Nat. Monument (27 and 5 years, respectively). June is the driest month (0.11 in.) and July and Aug. the wettest (1.5 and 1.8 in.). This is the sunniest and driest part of the United States. *Subject Headings:* 1. Climate of Sonora Desert 2. Bird ecology 3. Desert climates 4. Sonora Desert, Arizona.—*M.R.*

6.5-274

551.582.2(742)

*U. S. Quartermaster Corps. Environmental Protection Div., *Handbook of Mt. Washington environment*. Its *Report*, No. 218, Aug. 1953. 105 p. 17 figs., numerous charts, tables, bibliog. p. 15-16. DWB—Climatic data for Mt. Washington (N. H.) Observatory

(elev. 6290 ft) and Pinkham Notch (2000 ft elev.) which lies in a deep valley to the SE of Mt. Washington, are presented in tabular and graphic form and are analyzed and discussed in relation to vegetation, etc. The bulk of the report consists of detailed graphs of monthly or annual frequencies, means or extremes of temperature, precipitation, sunshine, solar radiation, cloudiness, snowfall, snow depth, humidity, maximum wind speed and percent of hours with hurricane winds, etc. The Mt. Washington test area of the U. S. Quartermaster Corps is an area of 130 square miles in the Mt. Washington region, and is subject to extreme wind, icing and temperature conditions and to great variability both in time and space. Snow has fallen on Mt. Washington during every month of the year at some time or other and a wind speed of 231 mph was recorded on April 12, 1934. *Subject Headings:* 1. Climatic data 2. Climate of Mt. Washington, N. H. 3. Mt. Washington, N. H.—M.R.

6.5-275

551.582.3(82)

*Bergeiro Hargain, José María, *Calendario meteorológico de validéz permanente*. [Meteorological calendar of permanent value.] Montevideo, Servicio Meteorológico, 1954. 36 p. Graphs. MH-BH—Monthly mean and daily variations in mean temperature, precipitation, pressure and storminess are presented in almanac form for Buenos Aires Province based on 60 years of observation. Daily mean temperature and rainfall probability is shown graphically for each month, with notes as to extremes which might be expected. *Subject Headings:* 1. Climatic data 2. Climatic calendars 3. Buenos Aires Province, Argentina.—M.R.

CLIMATIC CHANGES

See also: Singularities (Ehrlich), 6.5-67; Cyclonic intensity (Vitel's), 6.5-126; Climatic classification (Gregory), 6.5-293.

6.5-276

551.583

Aurada, F., *Klimaschwankungen der Gegenwart*. [Present climatic variations.] *Geographische Gesellschaft, Vienna, Mitteilungen*, 92(5/6):94-97, 1950. DLC—This article is a summary of a paper by Ahlmann, Hans W., *The present climatic fluctuation*, in *Geographical Journal*, London, 112(4/6):167-195, Oct.-Dec. 1948. (See item 1-140, Jan. 1950, MAB.) The author tests the climatological, glaciological, oceanographic, biological and eustatic evidence for climatic change since the last Ice Age recession and dating back to 2300 B.C. *Subject Headings:* 1. Climatic changes 2. Summaries. I. Ahlmann, Hans Wilhelmson. —I.L.D.

6.5-277

551.583:551.590.21

Bello, Francis, *Climate: the heat may be off*. *Fortune*, N. Y., 50(2):108-111, 160-164, Aug. 1954. figs., illus. DLC—The problems of a climatic warming trend and of the mechanism of the formation of ice ages are summarized. The article contains: (a) a review of Hurd C. Willett's solar ultraviolet and corpuscular energy emission theory of climatic changes (including the prediction of colder temperature in the decades to follow, with a low between 1960 and 1965); (b) results of an analysis of U. S. temperature data for the last 60 years, showing a slight increase up to the late thirties, but a decrease during the last 15 years; (c) a discussion of theories proposed by various scientists (among others, C. E. P. BROOKS) as explanations of the formation of ice ages. *Subject Headings:* 1. Climatic changes 2. Solar influences.—G.T.

6.5-278

551.583:581.056(73)

Climatic-archaeologic chronologies in the Colorado River Basin. *Tree-Ring Bulletin*, Tucson, Ariz., 20(3/4):28-30, Jan./April 1954. diagram (fold.). DWB—Quantitative chronologies from beams in Indian ruins are shown in a large folding diagram on standard scale of 2 mm/yr, going back to before 50 B.C. (in NE Arizona). *Subject Headings:* 1. Tree ring growth 2. Colorado River.—C.E.P.B.

6.5-279

551.583 551.586:59

Dué Rojo, Antonio (*Cartuja Observatory, Granada*), *Actualidades climatológicas*. [Climate today.] *Razon y Fe*, Madrid, 149(676):3-12, May 1954. 2 refs. DLC. Reprinted as:

Granada. *Observatorio de Cartuja, Trabajos Científicos* [Pub.] Ser. B, No. 59. DWB—A popular discussion of climatic change, the influence of climate upon man as expressed in a supposed relation between climatic cycles and historical cycles, the influence of climate upon man through the increase of atmospheric CO₂ as a result of human activity and hurricane forecasting in the U. S. *Subject Headings*: 1. Climatic variations 2. Climate and man 3. Cycles 4. Hurricane forecasting.—I.L.D.

6.5-280

551.583:529

Libby, W. F. (*Institute for Nuclear Studies and Dept. of Chemistry, Chicago Univ.*), **Chicago radiocarbon dates**, Pt. 4. *Science*, 119(3085):135-140, Jan. 29, 1954. 4 refs. DWB—Catalog of data from 37 samples dating from 6 years to 25,000 years of age, and from locations in Egypt, Iraq, Afghanistan, U. S., Alaska, Rhodesia and Japan, giving details of findings. These data are useful in establishing dates of floods, glacial conditions, crops and other phases of civilization which witness to climatic changes through the ages. *Subject Headings*: 1. Radiocarbon dating 2. Climatic changes.—M.R.

6.5-281

551.583:581.056(73)

Schulman, Edmund, **Dendroclimatic changes in semiarid regions**. *Tree-Ring Bulletin*, Tucson, Ariz., 20(3/4):26-27, Jan./April 1954. DWB—Tree-ring sequences from western America covering up to 1500 years or more can provide statistically homogeneous rainfall indexes (but cannot show small secular changes). Great drought in Colorado River basin A.D. 1215-1299, followed by groups of very wet years, is mentioned. *Subject Headings*: 1. Tree ring growth 2. Colorado River.—C.E.P.B.

6.5-282

551.583:551.585.3:581.9(8)

Wilhelmy, Herbert, **Die klimamorphologische und pflanzengeographische Entwicklung des Trockengebietes am Nordrand Südamerikas seit dem Pleistozän**. [The climatic-morphological and plant-geographical development of the dry area at the northern edge of South America since the Pleistocene.] *Die Erde*, 3/4:244-273, 1954. 3 figs., 8 photos, 67 refs. DLC—The distribution of humid and arid regions north of 6½°N is shown by numbers of wet and dry months and vegetation. The sheltered regions round Venezuela Gulf and the Leeward Is. have <600 mm a year. Geological history of the islands is discussed, including origin of inland waters and pluvial period valleys. On the mainland effects of drought and settlement on vegetation and soil are described. There is much evidence of a former pluvial period on the southern margin of the present "Trade wind desert." Rainfall of Guajira is estimated as 1000-1300 mm, 600-900 more than present. *Subject Headings*: 1. Climatic changes 2. Drought areas 3. Phytogeography 4. South America.—C.E.P.B.

6.5-283

551.583.2(52)

Arakawa, H., **Climatic change as revealed by the freezing dates of Lake Suwa in central Japan**. *Journal of Meteorology*, 12(1):94, Feb. 1955. 2 tables, ref. DWB—Summary of Arakawa, H., Fujiwhara on five centuries of freezing data of Lake Suwa in central Japan. *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B., 6:152-166, 1954. (See item 5.11-185, Nov. 1954, MAB.) Records show a long cold period in 15th through 17th centuries followed by a period of warmer winters. *Subject Headings*: 1. Historical climates 2. Freezing of lakes 3. Japan.—C.E.P.B.

6.5-284

551.583.3

Dury, G. H., **Weather, climate and river erosion in the Ice Age**. *Science News*, 33:65-88, Aug. 1954. 5 figs., 2 plates, refs. DWB—A reconstruction of the climate of the British Isles and western Europe in the last glacial maximum is given in charts of ice and vegetation, annual rainfall as percent of present, height of snow-line and mean temperature of Jan. and July. Each glacial period consisted of a cool oceanic phase (solifluxion) followed by a continental phase (loess). Climatic results of pollen investigations are described; the post-glacial is regarded as part of an interglacial sequence which passed its peak in the Climatic Optimum. After discussing difficulties of other evidence, author describes valley windings

as evidence of former much heavier rainfall over much of Europe. In England regional falls of 0.2 or 0.25 in./hr. are attributed to frontal precipitation due to increased storminess. These heavier falls occurred before and after Würm maximum. *Subject Heading: 1. Quaternary climates.—C.E.P.B.*

6.5-285

551.583.3

Schwarzbach, Martin, *Die Ursachen der Eiszeiten*. [The causes of ice ages.] *Umschau*, 54(15):449-451, Aug. 1, 1954. 4 figs., 5 refs. DWB—Ice ages are undoubtedly related to orogenesis but the connection is not close and cannot account for the repeated advances and retreats during long ice ages. For these the "radiation curve" of MILANKOVITSCH is often accepted as the explanation, but it is not supported by its recent revision by WOERKOM. Variations of emission of solar radiation are also considered, but author concludes that more data are necessary. *Subject Heading: 1. Ice age causes.—C.E.P.B.*

6.5-286

551.583.3(688)

Wayland, E.-J., *Outlines of prehistory and stone age climatology in the Bechuanaland Protectorate*. Brussels. Institut Royal Colonial Belge. Section des Sciences Naturelles et Medicales, Memoires (Collection in 8°), 25(4), 1954. 47 p. map, 2 plates, refs. DLC—Bechuanaland Kalahari has a desert morphology but an appreciable though erratic rainfall. There is evidence of long very dry periods alternating with four short pluvial periods of relatively heavy rainfall, flowing rivers, forest and grass, and human occupation. The origin and nature of the deposits is related to the hydrology. Present conditions date back only few thousand years. Climatic changes are compared with those of Kenya. *Subject Headings: 1. Quaternary climates 2. Bechuanaland.—C.E.P.B.*

6.5-287

551.583.3:551.482

Zandstra, K. J., *Die jungquartäre morphologische Entwicklung des Saartales*. [The late Quaternary morphological development of the Saar valley.] *Erdkunde*, 8(4):276-285 1954. 4 figs., 18 refs. English summary p. 276. DWB—The development of the Saar terraces is interpreted in terms of the four glacial periods and the late-glacial and post-glacial climatic changes. *Subject Headings: 1. Quaternary climates 2. Saar Valley.—C.E.P.B.*

6.5-288

551.583.3:141.332

Zapffe, Carl A., *A new theory for the great ice ages*. *Physics Today*, 7(10):14-17, Oct. 1954. 4 figs. DLC—The dates of the Nebraskan, Kansan, Illinoian and Wisconsin glaciations, and interglacial and postglacial stages, form logarithmic series, suggesting a new glaciation in 10,000 A.D. Dates agree with theosophical catastrophes, e.g., Mankato=destruction of Atlantis (9500 B.C.). Glaciation is attributed to eruptions along Atlantic submarine ridge, causing increased precipitation in N. America and Europe and lowering temperature generally through interception of solar radiation by volcanic dust. *Subject Headings: 1. Glacial periods 2. Theosophy.—C.E.P.B.*

6.5-289

551.583.78:551.526.6

Emiliani, Cesare (*Inst. of Nuclear Studies, Chicago Univ.*), *Temperatures of Pacific bottom waters and polar superficial waters during the tertiary*. *Science*, 119(3103):853-855, June 18, 1954. fig., table, 22 refs. DWB—The temperature results of three foraminiferal samples (Uppermost Pliocene, Lower, Middle Miocene, Middle Oligocene) plotted against a time scale proposed by Holmes indicate a progressive temperature decrease during the Tertiary. After examining various hypotheses suggested to account for this phenomenon, the author concludes that during the Tertiary, when the surface salinity of the polar water was closer to the average than now and the formation of bottom water was easier in spite of the higher temperature "the temperature of surface polar water and abyssal water of open oceanic basins were maintained at close values" by the sinking of the superficial water masses in the high latitudes and the flowing toward the lower latitudes as deep currents. The climatic differentiation between lower and higher latitudes was due to a smaller temperature gradient along the meridians since no ice was present in the polar seas, that no shallow anticyclones were present over the polar basin and the bottom water formed in high latitudes had an isotopic

composition very close to the average. *Subject Headings:* 1. Paleoclimatology 2. Climatic changes 3. Ocean temperatures.—*I.L.D.*

MICROCLIMATOLOGY

See also: *Micrometeorology* (Johns Hopkins Univ.), 6.5-12; *Shelter-belts* (Caborn), 6.5-194; *Shelter-belts* (Gloyne), 6.5-197; *Topoclimatology* (Thornthwaite), 6.5-270.

6.5-290

551.584.41:551.588.6

Richards, P. W., *The secondary succession in the tropical rain forest.* *Science Progress*, 43(169):45-57, Jan. 1955. 5 refs. DWB—The article includes some notes on the effect of the climatic type of the secondary growth in a cleared forest area (forest regeneration or savanna) and on the microclimate of secondary forest. *Subject Heading:* 1. Forest influences.—*C.E.P.B.*

6.5-291

551.584.42

†Waterhouse, F. L., *Microclimatological profiles in grass cover in relation to biological problems.* *Royal Meteorological Society, Quarterly Journal*, 81(347):63-71, Jan. 1955. 9 figs., 15 refs. DWB—Air temperature, humidity and wind speed were measured with thermocouples at heights between ground and 60 cm in grass stands in Angus. At midday highest temperatures were at level where crop was beginning to become dense. Shelter from wind raised temperature of upper levels. Later in day highest temperatures occur at the top. At night an inversion forms between ground and about 15 cm. Humidity on sunny days ranged from >90% in mat of dead grass to 50% at higher levels. Wind speed in tall grass decreased to nearly zero 30-40 cm below upper surface. Effect of microclimate profiles on a selected day on insect life is discussed. *Subject Headings:* 1. Microclimatology 2. Grassland.—*C.E.P.B.*

6.5-292

551.584.7

Lauscher, Friedrich, *Durchschnittliche Häufigkeit der Erdbodenzustände in verschiedenen Höhenlagen der Ostalpen.* [Average frequency of soil conditions at different altitudes of the eastern Alps.] *Wetter und Leben*, Vienna, 6(3/4):47-50, June 1954. fig., table. MH-BH—The frequency distribution of the ground conditions observed daily at weather stations provides data for a ten point scale for characterizing ground conditions more accurately. This scale is as follows: 0=dry, 1=moist, 2=wet (parts visible), 3=frozen hard, 4=partly covered with snow or hail, 5=covered with ice, 6=covered with melting snow, 7=not frozen but covered with less than 15 cm of snow 8=frozen but covered with less than 15 cm of snow, 9=covered with snow of more than 15 cm. The frequency distribution of these ground conditions for various localities in Austria at different elevations are given and their relationship to elevation and their daily distribution are analyzed. *Subject Headings:* 1. Soil climates 2. Soil climate classification 3. Austrian Alps.—*I.L.D.*

CLIMATIC CLASSIFICATION

See also: *Climatic changes* (Wilhelmy), 6.5-282.

6.5-293

551.585:551.583.14(4)

Gregory, Stanley, *Climatic classification and climatic change.* *Erdkunde*, 8(4):246-252, 1954. 9 figs., 4 refs. DWB—Migrations of climatic boundaries during 1871-1940 in non-Russian Europe are shown by comparing overlapping 30-year periods with 1901-30 standard. R. J. RUSSELL's concept of individual climatic years is applied to G. TREWARTHA's adaptation of KÖPPEN's system. Results are presented in maps showing frequency of location and width of transitions C-D (coldest month > and <3°C), a-b and b-c regions in each period. For 1901-30 E-T and f-s boundaries are also shown. The C-D boundary lay up to 500 miles further west in 1871-1900 than in 1901-30. The other boundaries changed much less. *Subject Headings:* 1. Climatic regions 2. Climatic trends 3. Climatic classifications 4. Europe.—*C.E.P.B.*

6.5-294

551.585

Sekiguti, Takeshi, **Some problems of climatic classification: a new classification of climates of Japan.** *International Geographical Congress, 17th, Washington, Aug. 8-15, 1952, Proceedings*, p. 41-46, [1952?] DLC—The climatic division of Japan was made considering the annual course of diurnal range of temperature, of rainy days, of the percentage of possible sunshine, and of the water surplus according to THORNTHWAITE, considering also annual means and totals. The boundaries were drawn where the least correlation coefficients between neighbouring stations appeared. A synthetic map of climatic regions shows 6 main regions with 26 subdivisions. *Subject Headings*: 1. Climatic classifications 2. Correlation coefficients 3. Japan.—A.A.

6.5-295

551.585.55(861):581.54

Weber, Hans, **Vegetationsbilder aus den Äquatorialen Hochanden.** [Vegetation pictures from the equatorial high Andes.] *Umschau*, 55(3):79-81, Feb. 1, 1955. 9 figs. DLC—Describes the landscape and vegetation of the steppe-like Páramo, in Colombia, between 3000 m and the snow line, with some notes on climate and weather. *Subject Headings*: 1. Ecology 2. Páramo, Colombia 3. Colombian Andes.—C.E.P.B.

6.5-296

551.585.7(234.3):06

Scorer, R. S., **Alpine meteorology.** *Weather*, 9(9):276-279, Sept. 1954. photo. MH-BH—Account of Third International Conference on Alpine Meteorology at Davos, April 12-14, 1954. It was largely devoted to studies of snow and avalanches. Some of the papers will appear in *Archiv für Meteorologie, Geophysik und Bioklimatologie*. *Subject Heading*: 1. Alpine Meteorology Conference.—C.E.P.B.

BIOCLIMATOLOGY

See also: **Climate to-day** (Due Rojo), 6.5-279; **Bioclimatology** (Schilling, Holzer), 6.5-334.

6.5-297

551.586:581.03

*Capell, John C., **Average growing season 1948-1953 for 15 central Oregon stations.** Portland, Oregon, U. S. Weather Bureau Office, June 1, 1954. 4 p. 4 tables. DWB—A temperature survey of the Madras area in the North Deschutes Irrigation District was begun by the U. S. Weather Bureau in 1948 with establishment of 5 stations equipped with thermometers and thermographs. Four other cooperative stations were included, and 6 stations in adjacent areas were used in survey, making 15 stations for a 6 year period (1948-1953). Stations and observers are described, and growing season data (last spring, first fall and number of days with temperature $>32^{\circ}$, 30° , 28° , 26° , and 24°) tabulated for each station. Bend at 3600' averages 33 days growing season (32°) and Campbell at 1900'—161 days. *Subject Headings*: 1. Growing season data 2. Frost data 3. Deschutes River Basin, Oregon.—M.R.

6.5-298

551.586:598.2

Bartholomew, George A., Jr. and Dawson, William R., **Body temperature and water requirements in the mourning dove, *zenaidura macroura marginella*.** *Ecology*, Durham, N. C., 35(2):181-187, April 1954. 8 figs., 2 tables, 10 refs. DA—This study involves an examination of: 1) body temperature in the presence and absence of heat stress, 2) temperature variations in different parts of the body at various environmental temperatures, 3) effects of temperature upon water intake and 4) effects of water deprivation upon water temperature. It was found that the daily temperature cycles of doves kept at 5°C and 23°C were similar. Even in the absence of heat stress the daytime temperature of the mourning dove varies over a range of several degrees C. At 39°C doves showed elevated body temperatures with relative elevation highest at night. Deprived of water and kept at 39°C body temperature was higher and more variable when water was available. Short term increase in air temperature caused increase in deep body, skin and leg temperature; short term decreases caused decrease only in leg and skin temperatures. *Subject Headings*: 1. Physiological climatology 2. Bird body temperature 3. Mourning dove.—I.L.D.

6.5-299

551.586:612:599.9

Davydov, V. G.; Byrzhieva, M. G.; Ivanova, N. I. et al., *Gigienicheskie meropriiatiia dlia preduprezhdeniia peregrevaniia organizma pri rabote v zharkikh klimaticheskikh usloviakh*. [Hygienic measures for preventing the overheating of the human organism during work under hot climatic conditions.] *Gigiena i Sanitariia*, Moscow, No. 5:18-23, May 1954. **DLC**—The observations on the physiological climatology of men at work were obtained during the course of an expedition of the Institute of Industrial Hygiene and Industrial Pathology of the Academy of Medical Sciences of the U.S.S.R. during 1951 and 1952 in Turkmenistan. The physiological responses of indigenous workers and immigrant workers are considered. The authors discuss the water requirements for various types of physical labor so as to facilitate proper heat regulation by evaporation of sweat. The regulation of water intake for acclimatized and nonacclimatized workers, the question of salt supplements, the addition of tea to water to relieve thirst without increasing unduly water intake, protection of workers against superfluous heat; the reduction of radiation, etc. are discussed. *Subject Headings*: 1. Acclimatization 2. Physiological climatology 3. Working capacity 4. U.S.S.R. I. Kepova, Z. V. II. Naumova, A. F. III. Rozanova, E. F. IV. Sadkovskaia, N. I.—*I.L.D.*

6.5-300

551.586:612

Petrun', N. M., *O roli kozhnogo pokrova v vydelenii dnuokisi ugleroda*. [On the role of skin in giving off carbon dioxide.] *Gigiena i Sanitariia*, No. 5:45, May 1954. table, ref. **DLC**—The increase in the elimination of CO₂ through the skin under high atmospheric temperature is discussed. At a temperature of 38-40°C the amount of CO₂ eliminated through the skin of men at rest may increase 3-4 times amounting to 1150 mg/hr and for men at work it may increase in the average 6-8 times to 21,442 mg/hr. A table gives coefficients for various atmospheric temperatures from 20-40°C to be applied to respiratory exchange in order to determine the true gas exchange of resting and working men. *Subject Headings*: 1. Physiological climatology 2. Temperature effects on respiratory exchange 3. Carbon dioxide.—*I.L.D.*

6.5-301

551.586:612.5:91.04

Abs, Otto, *Kälteschädigungen auf Polarexpeditionen*. [Cold injuries on polar expeditions.] *Polarforschung*, Kiel, [Ser.] 3, 23(1/2):219-233, 1953. **DWB**—Injury is caused by loss of more heat from the body surface than the blood can replace. It depends on rate and especially duration of heat loss brought about by low temperature, high humidity and wind. Preventive measures include suitable feeding and clothing, use of protective salves and oils, and a correct psychological attitude. Local freezing, e.g., face, nose, feet, need not result in injury if treated properly by warming whole body quickly but affected part slowly (*not* rubbing with snow) and avoiding infection. General freezing is best avoided by exercise beforehand. Blizzards, and especially immersion in cold water (which may be at -2°C) are most dangerous and call for quick intensive warming of the whole body followed by sleeping in a warmed bag and light food. So-called "lung chill" is excessive drying of lungs due to walking or skiing in a strong cold wind. (*To be continued.*) *Subject Heading*: 1. Frost injuries.—*C.E.P.B.*

6.5-302

551.586:615.8(05)

American Clinical and Climatological Association, *Transactions*, v. 1, 1884—Last issue seen, v. 51, 1935. No more published? Name of Association varies: American Climatological Association; American Climatological and Clinical Association. Index, v. 1-45, in v. 45. **DWB, DLC** (broken)—This journal, little-known in meteorological circles, was mainly devoted to medical articles, but nearly every volume contained one or more articles on medical climatology, such as White, Paul D. and Brasil, Aristoteles, *The relationship of weather in New England to cardiac conditions*, in 51:61-74, 1935. In 1935 the Association had 232 members (159 active). The first meeting was May 3, 1884 in Wash., D. C. *Subject Headings*: 1. Periodicals 2. Medical climatology.—*M.R.*

6.5-303

551.586:615.834

Kérdő, István, *Az éghajlati gyógyhelyek és klimatológiai vizsgálatuk*. [Climatic health resorts and their climatological investigation.] *Időjárás*, 58(1):32-39, Jan./Feb. 1954.

25 refs. Russian and French summaries p. 32. Discussion p. 55. **MH-BH**—Factors affecting bioclimatological qualities of a place (geographic location, altitude, orography, surface conditions, vegetation, structures, pressure, thermal factors, wind, radiation, humidity, precipitation, water regime, atmospheric pollution, atmospheric electricity, chemical composition of air, weather characteristics) are discussed with special reference to conditions in Hungary. Methods of bioclimatological research are described and importance of such research for evaluating existing health resorts and planning new ones is stressed. *Subject Headings*: 1. Health resorts 2. Climatotherapy 3. Bioclimatology 4. Hungary.—G.T.

6.5-304

551.586:628.8:629.135.2

Buettner, Konrad J. K., **Thermal stresses in the modern aircraft.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 5(3-4):377-387, 1954. 3 figs., table, 29 refs., eq. English, German and French summaries p. 377-378. **DLC**—Severity of an extreme bioclimate is expressed by the time a man can tolerate it. For temperatures 120° to -40°C author tabulates final result, tolerance time, warning symptoms, body adjustments, clothing requirements and body temperatures. Sources of heat and methods of heating and cooling are discussed; effect of air humidity is introduced. Effects of clothes are examined. Thermal capacity and adjustments of body by peripheral blood flow, shivering, perspiration and water diffusion are described, with some remarks on the bearing of wind evaporation on results of sweating. Finally proposals for preventing heat injuries to airmen are summarized. *Subject Headings*: 1. Bioclimatology 2. Aviation climatology.—C.E.P.B.

6.5-305

551.586:631

Went, Fritz W. (*Earhart Plant Res. Lab., Calif. Inst. of Tech., Pasadena*), **El efecto del clima sobre las plantas.** [The effect of climate on plants.] *Euclides*, Madrid, 14(155):1-8, Jan. 1954. 4 figs. **DWB**—The optimum climatic conditions (temperature, rainfall, humidity, photoperiodism, etc.) for plant growth vary with the type of plant (annual or perennial, hardness, size and other factors). A long and informative article on the general aspects of plant-weather relations, citing numerous examples but giving no data except in pictorial form. Experiments in a huge controlled climate chamber at the Earhart Plant Research Lab. at Pasadena, Calif., are described and the control room, some of the results of varying day and night temperatures by 3°C intervals (for tomatoes) are strikingly revealed in illustration, also homogeneity of nearly 100 plants grown under uniform conditions is shown in photographs. *Subject Headings*: 1. Climatic effects 2. Bioclimatic research 3. Climatic controlled laboratories 4. Plant climatology 5. Pasadena, Calif.—M.R.

6.5-306

551.586:632.6

Grainger, John, **Climate, host and parasite in crop disease.** *Royal Meteorological Society, Quarterly Journal*, 81(347):80-88, Jan. 1955. 3 figs., 2 tables, 16 refs. **DWB**—The relative effect of climatic factors on host and parasite is studied in SW Scotland. Early potatoes in relatively frost free coastal situations make appreciable growth before soil temperature rises to 43°F and are mostly lifted before eelworm cysts turn brown and lead to permanent soil infestation. This is mainly effect on parasite. Low incidence of club-root disease of turnips and swedes is associated with high soil temperature (above 60°F at 1 ft) in July; relations are also found with sunshine and rainfall. This relation is probably mainly through growth of host. *Subject Headings*: 1. Bioclimatology 2. Plant diseases.—C.E.P.B.

6.5-307

551.586:632.7:595

Johnson, C. G., **Aphid migration in relation to weather.** *Biological Reviews*, 29:87-118, 1954. 5 figs., 9 tables, 59 refs. Abstracted from reprint. **DLC**—A detailed study of numbers of aphids in flight under different weather conditions leads to the conclusion that first flights after moulting are related to the moulting peaks (highest in the morning) 24 hours earlier, and are only weakly correlated with present weather. *Subject Heading*: 1. Insect pests.—C.E.P.B.

6.5-308

551.586:633.1

†Pascale, Antonio Juan, **Comportamiento fotoperiódico de algunos trigos Argentinos.** [Photoperiodic behavior of some Argentine wheat varieties.] *Meteoros*, Buenos Aires,

3(1):97-112, Jan./March 1953. 6 figs., table, bibliog. p. 112. Spanish and English summaries p. 97. **DWB**—The photoperiodic response of 32 varieties of wheat sown continuously in Argentina between March and Oct. 1950 and 1951 is described. The development of all the varieties was accelerated by increasing the length of day. In respect to the effect of winter cold and of length of day upon tasseling the wheats could be grouped into three classes: 1) those requiring an extensive light period in order to reach the reproductive stage; 2) those requiring that light period but a definite amount of hours of cold during the thermal stage; and 3) varieties which are indifferent to light periods. *Subject Headings: 1. Wheat phenology. 2. Argentina.—I.L.D.*

6.5-309

551.586:633.491:632.9

Unger, K., *Zur klimatologischen Analyse der Kartoffel-Abbau- und Gesundheitslagen.* [On the climatological analysis of potato disease and health sites.] *Angewandte Meteorologie*, 2(1):26-32, Feb. 1954. 5 figs., table, 6 refs. **MH-BH, DWB**—A map by R. SCHICK showing parts of E. Germany where potatoes are diseased and healthy is discussed in relation to biology of virus-spreading leaf louse. Spread of disease is related to short-period flight activity, which depends mainly on temperature and wind force. A map of mean frequency of maxima of 23°C or more, June 1 Aug. 15, 1949-52, agrees closely with SCHICK's map, the greatest frequency corresponding with unhealthy potato regions. *Subject Headings: 1. Potato blight. 2. Germany.—C.E.P.B.*

6.5-310

551.586:646

551.582.2(794)

*U. S. Quartermaster Corps. Research and Development Branch. Environmental Protection Section, *Studies on clothing for hot environments. Death Valley, 1950. Part I, Experiments and results; Part II, Environment.* Its *Report*, No. 178, June 1951. 2 pieces. figs., tables. **DWB**—Various items of military clothing suitable for wear in hot deserts were tested with reference to their effect upon human heat tolerance. Pt. I contains a description of the research methods, a description of tests with footgear and head gear, outer body clothing and underclothing; the results of physiological response including rectal temperature, skin temperature, sweat loss, etc., of the psychological reactions are given in tables and their significance is discussed. Also the environmental meteorological data during some of the tests are given in tables and a comparison is made between physiological reactions and atmospheric temperature conditions. Pt. II contains in addition to a description of the physical geography and biogeography the following meteorological data obtained during the summer of 1950: air temperature, ground surface temperature, ground temperature, effective sky temperature, black body temperature of surroundings, humidity, wind speed and direction, radiation, cloudiness. The appendix contains the complete record of the meteorological data obtained. *Subject Headings: 1. Clothing climate. 2. Clothing requirements. 3. Heat tolerance. 4. Climate of Death Valley, Calif. 5. Death Valley, Calif. I. Lee, D. H. K. II. Katin, Joseph G. III. Woodcock, Alan H. IV. Goddard, William L. V. Woodbury, Robert L. VI. Sissenwine, Norman VII. Anstey, Robert VIII. Meigs, Peveril.—I.L.D.*

UPPER AIR CLIMATOLOGY

6.5-311

551.587:551.509

*Dopoorto, Mariano, *On the objective determination of minimum density and frequency of upper air observations, to meet stated requirements.* *Eire. Meteorological Service, Technical Note*, No. 16, April 1954. 24 p. 11 figs., 7 tables. **DWB**—It is shown how a knowledge of the average, maximum, etc. variability of a meteorological magnitude as a function of distance and time permits the determination of the maximum distance d from a station and interval τ from the time of observation for which a particular value of the magnitude can be accepted with a certain probability as representative within a predetermined accuracy. If a network of stations can be used the distance between stations can be greater than $2d$ and the interval between observations longer than τ without loss of accuracy. It is also shown how the appropriate values may be determined. Values of the variability in space and time of the height of the 500, 300 and 100 mb levels and of the temperature and vector wind at the same isobaric levels in the neighborhood of Valentia Observatory are given. *Subject Headings: 1. Aerological networks. 2. Aerological data. 3. Valentia, Ireland.—Author's abstract.*

ENVIRONMENTAL INFLUENCES

See also: **Break of climat. record** (Macky), 6.5-49; **Soil temps.** (Coutts), 6.5-166; **Shelter-belts** (Gloyne), 6.5-197; **Turbulence diffusion** (Kuroiwa), 6.5-226; **Forest influences** (Richards), 6.5-290.

6.5-312

551.588.1:525.3

Maksimov, I. V., **Dvizheniia poliуса zemli i mnogoletnie izmeneniia kontinental'nosti klimata Evropy.** [The movement of the earth's pole and perennial changes of the continentality of the European climate.] *Akademiia Nauk SSSR, Moscow, Doklady*, 93(5):803-806, Dec. 11, 1953. 2 tables, 6 refs. **DLC**—Phenomena of perennial changes of the earth's true pole radius-vector are analyzed by the author. For the period 1890 to 1923 the perennial component of the earth's pole movements, established by a superposition of the free oscillations of the instantaneous pivotal axis on its forced oscillations, changed in the limits of 5.7 to 8.7 years (with an average length of this period 6.3 years). The amplitude of perennial movements of the earth's pivotal axis changed during this time to 190% of its lowest value. In accordance with this the values of both the period and the magnitudes of the sea and the climatic perennial nutation cyclicity has to change as well. As a result of this the "7 year" cycle of climate continentality of the earth's mean latitudes appears to be a variable phenomenon capable of manifesting itself, at times, with particular force (as at the end of last century) or of disappearing completely. *Subject Headings: 1. Polar displacement 2. Continentality 3. Europe.—A.M.P.*

6.5-313

551.588.4(718)

*§Stark, R. G., **Some effects of Gander Lake on Gander weather.** *Canada. Meteorological Div., Cir-2437; Tec-181; Local Forecast Study*, No. 26, Feb. 17, 1954. 28 p. 14 figs., 14 tables, 4 refs. Mimeo. **DWB**—Gander Airport is located near the east end of Gander Lake, Newfoundland, a remarkable lake a mile wide, a mile deep and 33 miles long, and sunk 500 ft below surroundings. Because of its extreme depth, the lake seldom freezes, hence its use as a seaplane base for transatlantic flights in the 1930's. The open water of the lake is a warm source from Oct. to March and cold source from May to Aug. Hourly reports and synoptic charts for 1952 (and Dec. 1951) were used to study 3 main effects of the lake: 1) fog or stratus from lake over airport with W winds, 2) low clouds due to uplift from lake, 3) "Basin" effect. The air masses, winds, synoptic situations and attending fog, sky, visibility and ceiling conditions are analyzed and examples given in text and illustrations by synoptic charts. Minor effects of lake, topography and moisture are also considered. *Subject Headings: 1. Lake influences 2. Local forecast studies 3. Synoptic climatology 4. Gander, Newfoundland.—M.R.*

MISCELLANEOUS

COSMIC INFLUENCES

See also: **Climate** (Bello), 6.5-277.

6.5-314

551.590.2:523.78

von Klüber, H., **Die Sonnenfinsternis vom 30. Juni 1954.** [The solar eclipse of 30 June 1954.] *Naturwissenschaften*, 42(1):3-8, Jan. 1955. 6 figs., 18 refs. **DWB**—The area of visible eclipse is mapped and reasons for locating expeditions in S. Sweden are set out. Results of the various expeditions are summarized with references. They included photometry of corona, deflection of light, photoelectric investigation of the flying shadow and scintillation, zodiacal light and radioastronomical observations. Unfortunately most of the programmes were interfered with by cloud. *Subject Heading: 1. Solar eclipses.—C.E.P.B.*

6.5-315

551.590.25

Feinstein, J. (*Natl. Bureau of Standards, Wash., D. C.*), **On the nature of the decay of a meteor trail.** *Physical Society of London, Proceedings, Sec. B*, 65(393):741, Sept. 1, 1952.

7 refs. **DWB**—A note on recent contributions to the subject. The concept of dissociative recombination reconciles discrepancies between theoretical and observed values of the decay (BATES' hypothesis). The assumption of a shock wave expansion made by the author is explained. *Subject Headings:* 1. Meteor trails 2. Ionosphere.—A.A.

VISIBILITY

See also: Visibility studies (U. S. W. B.), 6.5-9; Forecasting snowfall (Richards), 6.5-77.

6.5-316

551.591:535.7

Barteneva, O. D., *Vidimost' ognē v polevykh usloviakh*. [Light visibility in field conditions.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofizicheskaiia*, No. 1:77-82, 1954. fig., 2 tables, 14 refs. **DLC**—The threshold of illumination on the pupil equal to 2×10^{-7} lux does not correspond to the moment of loss of light visibility. This is presented in a curve developed under field conditions and showing the dependence of the threshold of illumination on the pupil upon the brightness of the background; according to this curve the threshold of illumination is assumed to be equal to 10^{-8} lux for calculating the visibility of light or the transparency of the atmosphere on dark nights. *Subject Headings:* 1. Contrast threshold 2. Visual acuity 3. Visibility.—I.L.D.

6.5-317

551.591:551.575:551.521.3

Koomen, M. J. and Dunkelman, L., *Visibility of light sources through fog*. U. S. Naval Research Laboratory, *NRL Memorandum Report*, 245, Dec. 14, 1953. 6 p. 3 figs., 2 tables. **DWB**—The threshold ranges of steady white lights of various candle powers have been calculated for various amounts of fog in the atmosphere. The calculations were made for both day and night, for conditions from haze through thick fog. From the threshold range, the practical range of a light source can be determined by applying a suitable "field factor," whose value will depend upon the circumstances under which the light source is to be detected. A table of typical field factors, and the circumstances under which they should be used, is included. The threshold ranges in this report were calculated from data contained in U. S. Naval Research Laboratory, *Report H-2627*. *Subject Headings:* 1. Visibility in fog 2. Transmission of light.—Authors' abstract.

OPTICAL PHENOMENA

See also: Optics and meteorology of atmos. turbidity (Volz), 6.5-10; Color of the sky (Möller, others), 6.5-146.

6.5-318

551.593

*†Lossnitzer, H., *Studien über das Himmelslicht*. [Studies of the sky light.] Germany. *Deutscher Meteorologischer Dienst im Französischen Besatzungsgebiet, Wissenschaftliche Arbeit*, 1:108-128, 1947. 10 figs., 9 tables, 38 refs. **DLC**—Theory and numerous examples on the qualitative relationship between turbidity, light density and polarization. *Subject Headings:* 1. Turbidity 2. Sky light color 3. Polarization.—M.R.

6.5-319

551.593.1

Abnormal refraction: North Atlantic Ocean. Off Cape Finisterre. Falkland Islands. Vicinity of Cape Town. Off Cape Town. Off North African coast. Canterbury Bight. St. Vincent's Gulf. *Marine Observer*, 25(167):31-34, Jan. 1955. 13 figs. **MH-BH**—Feb. 23, 1954, in $44^{\circ}30'N$, $47^{\circ}42'W$, 4 horizons seen. Off C. Finisterre on March 2, 1954, 2 suns seen at sunset. Abnormal refraction, duplication of horizon and distortion of setting sun off Cape Town on Feb. 8 and March 19, 1954. Abnormal visibility and distortion of ships in $37^{\circ}18'N$, $9^{\circ}24'E$ on March 2, 1954. Superior mirage in $45^{\circ}15'S$, $171^{\circ}25'E$ on March 17 and $36^{\circ}S$ $138^{\circ}18'E$ on Jan. 23, 1954. Sketches of many of these are given. *Subject Headings:* 1. Mirages 2. Refraction phenomena 3. North Atlantic Ocean.—C.E.P.B.

6.5-320

551.593.1

Bourgoin, Jean-Paul, *La réfraction terrestre dans les basses couches de l'atmosphère sur l'inlandsis Groenlandais*. [Refraction in the lowest atmospheric layers over the Greenland ice cap.] *Annales de Géophysique*, 10(2):168-174, April/June 1954. 7 figs., 2 tables, eqs. DWB—In connection with geodetic leveling operations, the author discusses the thermal stratification of the lowest atmospheric layers over the ice cap and the resulting refraction phenomena. Data for temperature as a function of height above the group up to 3 m are given for various hours of the day (June 1-July 17, 1950). Observed mirages are discussed. *Subject Headings*: 1. Refraction phenomena 2. Mirages 3. Greenland.—G.T.

6.5-321

551.593.1:551.521.61

Rank, D. H. and Shearer, J. N. (Dept. of Physics, Penna. State College), *Index of refraction of air in the infrared*. *Optical Society of America, Journal*, 44(7):575, July 1954. table, 3 refs. MH-BH—EDLEN's (1953) formula for dispersion of air in entire spectrum makes use of data in the visible and UV portions of the spectrum. The author presents data for wave lengths $>1\mu$ made in vacuum, and although not as precise as the best measurements in the visible portion of the spectrum, the results give an index of refraction equal to that predicted by EDLEN. *Subject Headings*: 1. Refractive index 2. Infrared refraction.—M.R.

6.5-322

551.593.5

Deirmendjian, Diran and Sekera, Zdeněk (Univ. of Calif. at L.A.), *Quantitative evaluation of multiple scattered and diffusely reflected light in the direction of a stellar source in a Rayleigh atmosphere*. *Optical Society of America, Journal*, 43(12):1158-1165, Dec. 1953. 3 figs., 9 tables, 10 eqs. DWB—The specific intensities of nonparallel light in the direction of a stellar source, such as the sun, resulting from multiple scattering and diffuse ground reflection of a unit flux of parallel radiation incident on a plane evaluated following S. CHANDRASEKHAR's extension of the Rayleigh theory. Values are given as a function of direction of the source and normal optical thickness covering the visible and near ultra violet spectrum. It is shown that the flux resulting from such nonparallel radiation, for a sufficiently small solid angle (10^{-3} radian) around the source, when the latter is within 50° or less of the vertical is of the order of 10^{-6} of the reduced flux of the direct solar beam, for radiation within the visible range. The relative importance of the scattered light increases with normal optical thickness and zenith distance of the source. It is pointed out that certain observations of apparent atmospheric transmissions of solar radiation in the blue end of the visible spectrum exceed in magnitude significantly the values obtained from the exact Rayleigh scattering theory, and it is suggested that this anomaly may be due to non-Rayleigh particles existing in the high atmosphere, with strong forward scattering characteristics. *Subject Headings*: 1. Atmospheric optics 2. Diffusion equations 3. Scattering of light.—Authors' abstract.

6.5-323

551.593.5

Richardson, W. E., *Optical effect at Alston*. *Weather*, 10(1):29, Jan. 1955. DWB—Note on vivid green of vegetation associated with a brilliant red sunset. *Subject Heading*: 1. Sunset colors.—C.E.P.B.

6.5-324

551.593.55 551.593.7

Robley, R. (Pic du Midi Observatory), *La diffusion multiple dans l'atmosphère déduite des observations crépusculaires*, Pt. 2. [Multiple diffusion in the atmosphere deduced from twilight observations, Pt. 2.] *Annales de Géophysique*, 8(1):1-20, Jan./March, 1952. 6 figs., tables, 24 refs., 30 eqs. MH-BH—Results of polarization measurements made visually and spectrophotometrically of the zenith twilight. The degree of polarized light decreases from 80% to 20% during twilight. The curve obtained in the $4500\text{\AA}$ region is characterized by a flat portion which is not found in the $6500\text{\AA}$ region. The theoretical value of zenith twilight polarization is determined by using CHANDRASEKHAR's radiative transfer work. The interpolation of experimental curves is simple if an exponential atmosphere is assumed. If not, then the existence of a depolarizing layer or some other unverified hypothesis must be invoked. (For Pt. I see item 3.11-266, Nov. 1952, MAB.) *Subject Headings*: 1. Twilight zenith polarization 2. Multiple diffusion of twilight.—From author's abstract.

6.5-325

551.593.61

Black, Donald M., **The brocken spectre of the Desert View Watch Tower, Grand Canyon, Arizona.** *Science*, 119(3083):164-165, Jan. 29, 1954. fig. Discussion by A. G. Shenstone, *Ibid.*, 119(3094):511-512, April 16, 1954. **DWB**—The supervisor of the Desert View Watch Tower saw a brocken spectre around the elongated shadow of the Watch Tower as projected onto clouds below the Tower but over the Grand Canyon, on two occasions in 1952: once in the spring and once on Dec. 1. The author studied the phenomenon on the latter occasion, and mentions other similar occurrences in the region, though CHARLES FARMER, the supervisor, had not seen one before in 20 years. HUMPHREYS (1920) explanation is quoted, and the spectre and its color scheme are shown in a schematic diagram. In the Discussion, SHENSTONE mentions that the "anticorona" is seen very frequently from airplanes flying above clouds or fog, and usually the corona surrounds the image of the plane, though that is not necessary to the formation of the corona. H. C. VAN DE HULST published an explanation in *Optical Soc. of Am., Journal*, 37:16, 1947. **Subject Headings:** 1. Brocken spectres 2. Grand Canyon, Arizona. I. Shenstone, A. G.—*M.R.*

6.5-326

551.593.63

Ashmore, S. E. and Smith, Dennis E., **The halo display of 2 March 1954.** *Weather*, 9(10):322, Oct. 1954. **MH-BH**—ASHMORE discusses various points in the note of the same title by Lacy, R. E.; Ellison, M. A. and Ashmore, S. E., *Weather*, 9(7):206-215, July 1954 (see item 6.1 339, Jan. 1955, *MAB*) and suggests reviving term "chionisms" for halo phenomena. SMITH discusses frequency of halo complexes and refers to sun pillars. **Subject Heading:** 1. Halo observations.—*C.E.P.B.*

6.5-327

551.593.63

Richard, R., **Phénomène optique remarquable.** [Remarkable optical phenomenon.] *La Météorologie*, 4th Ser., No. 32:301-302, Oct./Dec. 1953. photo. Also: Vassy, E., **Quelques remarques sur un phénomène de mirage du disque solaire.** [Some remarks on the phenomenon of a mirage of the solar disk.] *Ibid.*, p. 302-303. **MH-BH**—A rare photograph is reproduced of the sun and 7 mock suns (or "satellites") which appeared near sunset on Sept. 13, 1953 at the beach of St-Brévin l'Océan, at 1800 h. and lasting about 3 minutes. The edges of the mock suns were distinct and color blue-violet, whereas the sun itself was orange-red. The ensemble seemed to be mobile and disappeared in succession but almost simultaneously. It looked like a cluster of balloons a short distance above the water. VASSY quotes from ARAGO, BIOT and MASCART regarding the optical geometry of mirages seen from mountains when the index of refraction is at a maximum. The only difference here is that the luminous source is outside the atmosphere and not on the earth. The blue color is easily explained. **Subject Headings:** 1. Mock suns 2. Parhelia 3. Optical phenomena 4. St-Brévin l'Océan, France.—*M.R.*

6.5-328

551.593.63:629.135:2

*Visser, S. W., **De halostatistiek voor, gedurende en na de oorlog.** [Halo statistics before, during and after the war.] *Hemel en Dampkring*, 52(3):55-58, March 1954. **MH-BH**—Data on various types of halo phenomena observed in the Netherlands are tabulated by months, seasons and decades as well as for the war years (1943-45) and for the year 1945 separately, to see if there was any influence of the war (specifically on account of large fleets of bombers passing over Holland in 1945 at high altitudes, with resulting condensation trails or ice crystals produced by exhaust gases). The statistics show very little significant difference in number of halos observed during the war years or in early 1945, compared with post-war years, though the number was greater than in the period 1921-30. More "peculiar forms" of halo were recorded however, in early 1945 than in other periods and these might be attributed to airplanes. **Subject Headings:** 1. Halo data 2. Condensation trails 3. Wartime influences on clouds 4. Netherlands.—*M.R.*

6.5-329

551.593.64:551.515.8

Piaskovskaia-Fesenkova, E. V., **Okolosolnechnyi oreol v infrakrasnykh luchakh spektra.** [The circumsolar corona in the infrared spectrum.] *Akademiia Nauk SSSR, Doklady*,

85(5):989-992, 1952. 4 figs., table, ref. **DLC**—Discusses reality of instrumental observations, verifies the linear dependence of the "relative" intensity of corona on the optical thickness of the atmosphere and shows the influence of air masses. The relative intensity of the corona was 28 times greater in tropical air than in arctic air. *Subject Headings: 1. Coronas 2. Air mass effects.—A.A.*

6.5-330

551.593.65

Hillman, G. F., "Fawley flame." *Meteorological Magazine*, London, 83(979):25-26, Jan. 1954. photo. **MH-BH**—"Fawley flame" is the exhaust flame from Esso Oil Refinery, intensity $\frac{1}{2}$ to 3 million c.p. On July 5-6, 1953, its reflection was seen from 2.2 miles as a well defined reddish glow on Ci and CiSt at a height of 25,000 ft. *Subject Heading: 1. Cloud coloration.—C.E.P.B.*

6.5-331

551.593.65

Reesinck, J. J. M. and Dee, R. W. R. (*Indonesia*), **Blue clouds**. *Madjalah Ilmu Alam untuk Indonesia [Indonesian Journal for Natural Sciences]*, Bandoeng, 109(4/6):212-215, July/Dec. 1953. figs., 11 refs. **MH-BH, DLC**—In the tropics observers have noted that cumulus or altocumulus clouds often appear blue when first forming—even in contrast to the blue sky. The physical explanation is attempted on the basis of the extremely fine particles which form (when water vapor first condenses) the larger the particles the longer the wave length, so with normal cloud drop size the color is red or white, whereas the <0.1 mm size necessary for blue color is too small for more than temporary duration. Light saturation and density differences as well as scattering effects are also involved. *Subject Headings: 1. Blue clouds 2. Scattering effects 3. Tropical clouds.—M.R.*

6.5-332

551.593.653

Zerinváry, Szilárd, **A világító ezüsthólok és eredetük**. [Noctilucent clouds and their origin.] *Időjárás*, 58(30):169-178, May/June 1954. 8 figs., 2 tables. Russian and French summaries p. 169. **MH-BH**—Recent theories concerning the origin of noctilucent clouds are reviewed. Discussed in particular are the theories of VEGARD, who believes noctilucent clouds are derived from solar corpuscular radiation, and of KHVOSTIKOV, who analyzes the role played by vapor pressure and atmospheric pressure in their formation. *Subject Heading: 1. Noctilucent clouds.—Trans. of author's abstract.*

ELECTRICAL PHENOMENA

See also: **Electrometers** (Koenigsfeld, Piraux), 6.5-62; **Electrical capacity ratio** (Martinioli), 6.5-63.

6.5-333

551.594

537.525.3

Menes, M. and Fischer, L. H. (*Dept. of Physics, New York Univ.*), **Positive point-to-plane corona studies in air**. *Physical Review*, 94(1):1-6, April 1, 1954. 10 figs., refs. **DWB**—Formative time lags for the development of the positive point-to-plane corona in dry air were measured oscillographically at pressures ranging from atmospheric to a few centimeters of Hg. Studies with a photomultiplier tube show that the observed formative lags are associated with a filamentary streamer type of corona. These corona formative lags are of the order of 10^{-7} sec even near threshold and vary much more slowly with overvoltage than do uniform field formative lags in air. The results indicate that no long buildup process is associated with the formation of the filamentary streamer type of corona in air, and in particular rule out any cathode secondary mechanism from playing a role in the formation. Near atmospheric pressure, with the experimental conditions used, the corona formative time lags were often too short to be resolved from the statistical scatter; when resolvable they were found to be too long to be ascribed solely to a single transit time of the initiating electron avalanche across the high field region of the gap. The results therefore do not preclude a fast buildup process in the gas preceding streamer formation. Threshold measurements on both impulse and dc corona indicate that the steady glow type of corona has a different threshold than the streamer

type. No formative lag data on the steady glow corona were obtained. *Subject Headings:* 1. Coronas 2. Atmospheric electricity 3. Electrical discharges.—*Authors' abstract.*

6.5-334

551.594:551.586

Schilling, Gerhard F. and Holzer, Robert E., *Über mögliche Zusammenhänge zwischen Bioklimatologie und Luftelektrizität*. [Possible relationships between bioclimatology and atmospheric electricity.] *Wetter und Leben*, 6(1/2):13-16, March 1954. 9 refs. DWB—Specific physiological reactions to non-thermal weather changes occur when the subjects are both in the open air and in closed spaces and the physiological responses are manifested before the actual weather changes. The possibility is suggested that electromagnetic waves from storm centers might account for these phenomena and evidence is presented that indicates that the variations in the electrical conductivity of the atmosphere are parallel indoors and outdoors and show variations number of hours before the appearance of a meteorological front so that changes in atmospheric electricity are the mediating element between weather change and physiological response. The relationship between cosmic radiation, local radiation and nuclei content of the atmosphere, atmospheric ion concentration and physiological reaction are discussed. *Subject Headings:* 1. Atmospheric electricity 2. Physiological climatology 3. Physiological responses to weather changes.—*I.L.D.*

6.5-335

551.594.11:551.594.21

†Reiter, Reinhold, *Synoptisch-luftelektrische Daueruntersuchungen im Hochgebirge im Dienste der Meteorologie*. [Continuous synoptic observation of atmospheric electricity in high mountains for meteorological purposes.] *Geofisica Pura e Applicata*, 28:223-245, 1954. 10 figs., 28 refs. German and English summaries p. 223. MH-BH—In order to investigate the relations between atmospheric electric phenomena in different altitudes and various meteorological processes, continuous automatic records of the atmospheric potential gradient have been obtained in the Alpine Region for several years. Two stations in the Allgäu Mountains: Oberstdorf (815 m) and Nebelhorn (1930 m) and four stations in the Wetterstein Mountains: Garmisch-Partenkirchen (705 m), Eibsee (1000 m), Riffelriss (1640 m) and Zugspitze (2963 m) serve this purpose. Using typical records to illustrate: 1) Local effects at both valley stations and mountain stations, caused by a) aerosols (dust, smoke, vapor, fog, etc.), b) orographic winds, c) foehn; 2) Synoptic aspects of atmospheric electricity: a) the behavior of the potential gradient both above and below inversions and upper limits of convection in order to study the lowest layer of the atmosphere ("Grundschicht," SCHNEIDER-CARIUS), b) the vertical variation of the electric charge in stratus (polarization of stratus clouds), c) vertical variation of electric charge in shower and thunderstorm clouds in order to study their electric structure and their development, d) vertical exchange of air masses, e) the behavior of the atmospheric potential gradient during various forms of precipitation, especially if there is a change of the phase. *Subject Headings:* 1. Atmospheric electricity 2. Potential gradient 3. Thunderstorm electricity 4. Bavarian Alps, Germany.—*From author's abstract.*

6.5-336

551.594.13 533

Biondi, Manfred A. and Chanin, Lorne M., *Mobilities of atomic and molecular ions in the noble gases*. *Physical Review*, 94(4):910-916, May 15, 1954. 10 figs., 2 tables, 22 refs., 6 eqs. DWB—A method is described for measuring the mobilities of ions of near-thermal energy. A pulse of ions is generated in a discharge region and passes through a grid into a drift region where a uniform electric field cause the ions to move to a collector electrode. The mobilities are determined from measurements of the transit time of the ions in crossing the drift space. The experimental mobility values for thermal energy ions moving in their parent gases at 300°K and a gas density of 2.69×10^{19} atoms/cc are $\mu_0 = 10.5$ cm²/volt-sec (He⁺), 20.3 (He₂⁺), 4.0 (Ne₂⁺), 1.60 (A⁺), 2.65 (A₂⁺), 0.90 (Kr⁺), 1.21 (Kr₂⁺), 0.58 (Xe⁺), and 0.70 (Xe₂⁺). These values are in good agreement with available theoretical results. The measurements join smoothly at higher ion energies with the measurements made by HORNBECK and by VARNEY except in the case of A₂⁺. In addition, the results indicate that earlier measurements at near-thermal energy by TYNDALL and collaborators refer to the molecular ions in helium and neon, and to the atomic ions in krypton and xenon. *Subject Headings:* 1. Ion mobility 2. Nuclear physics.—*Authors' abstract.*

6.5-337

551.594.13

Smith, L. G. and Schilling, G. F., **On the variation of conductivity within sealed rooms.** California. Univ. at L. A. Institute of Geophysics, Contract AF 19(122)-254, Scientific Report No. 7, April 3, 1953. 2 tables, graph, 7 refs., eqs. DWB—Experiments are described in which the electrical conductivity of air was measured inside sealed rooms. It was found that the conductivity increased regularly, with some fluctuations superimposed, towards a certain limiting value which was about the same in each of the rooms. The interpretation of this variation is examined on the basis of ion-equilibrium. It is suggested that the present investigation shows the possibility of extension to the study of ion-balance and to the determination of turbulent diffusion coefficients. *Subject Heading: 1. Electrical conductivity of air.—From authors' abstract.*

6.5-338

551.594.13

Stergis, C. G., **Study of atmospheric ions in a non-equilibrium system.** U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 26, April 1954. 28 p. 12 figs. (incl. photo), 2 tables, 13 refs. DLC. 4 p. article of same title, in *Journal of Geophysical Research*, 29(1):63-66, March 1954. 3 figs., 2 refs., 4 eqs. MH-BH—The time variation of the concentration of atmospheric ions in a non-equilibrium system has been determined experimentally and theoretically. The results indicate that ionic equilibrium, once disturbed, may not again be attained until a time up to 15 minutes has elapsed. *Subject Heading: 1. Atmospheric ions.—Author's abstract.*

6.5-339

551.594.14:551.510.42:551.578.11

*Chatterjee, Santimay; Patro, A. P.; Basu, Binayak; Bhattacharyya, R. L. and Hosain, Fazie, (*Inst. of Nuclear Physics, Calcutta*), **Presence of radioactive dusts over Calcutta.** *Science and Culture*, Calcutta, 19(11):570-571, May 1954. table, 2 refs. Also their: **Measurements on radioactive dusts over Calcutta.** *Ibid.*, 20(8):399-401, Feb. 1955. table, 5 refs. DWB—Following the nuclear explosions in the Pacific on April 4, 1954, tests were made at Calcutta to detect possible α , β or γ radioactive particles settling from the atmosphere. No rain occurred until April 29. Samples of rain water and dust (1000 cc) gave definite indication of β activity (120 ± 10 counts/min/gram). Dust collected from greasy parts of airplanes arriving daily at Dum Dum Airport from Ganhati and on Sunday from Singapore from April 14-22 showed no α or γ activity, but consistent β activity ranging from 5.8 to 121 counts/min/gram. The highest value was on April 11 on a plane flying to Djakarta and back at 12,000 ft. None of these rates are dangerous but do indicate transport and detection of activity 5000 miles from source. In the second article the authors report that radioactivity was detected in rainwater collected at Calcutta between April 29, 1954 and July 5, 1954, although no thermonuclear explosions were announced in the press. The Alpha and Gamma activity was not found to be significant, but β activity as shown in following table, shows a definite increase after May 15, indicating an explosion around May 11, though location could not be determined.

Rainwater collected on	Radioactivity of the Rainwater		
	Radio-activity tested on	Ratio to background	Counts/litre/min
29-4-54	29-4-54	2.5	240 $\pm$ 21
15-5-54	18-5-54	9	320 $\pm$ 52
20-5-54	25-5-54	7	1562 $\pm$ 35
22-5-54	28-5-54	7	1452 $\pm$ 46
1-6-54	7-6-54	2.5	200 $\pm$ 13
4-6-54	7-6-54	2.8	1043 $\pm$ 60
5-7-54	12-6-54	1.2	very small
S ⁷¹ Dust collected from a plane coming from Djakarta on 11-4-54		4	121 $\pm$ 5
			per gm per min

Amounts in rainwater are too small to harm plant or animal life in India. Analysis of indicated half-lives gives clue to possible Ce¹⁴¹ content. *Subject Headings: 1. Radioactive dust*

2. Radioactivity of rainwater 3. Nuclear explosions 4. Dum Dum Airport, Calcutta, India.—*M.R.*

6.5-340

551.594.14

*Garrigue, Hubert, *Sur la radioactivité anormale de l'atmosphère*. [On abnormal radioactivity of the atmosphere.] *Académie des Sciences, Paris, Comptes Rendus*, 235(23):1498-1499, Dec. 10, 1952. table. DWB—The tabulated recordings on the radioactivity of the atmosphere were based on ground observation at 1500 m (Puy de Dôme) and flights up to 5000 m on selected days from April 11 through July 1, 1952. This span of time permits no satisfactory conclusion to be drawn as to speed of propagation and dissemination of radioactive "atomic" clouds. (For previous articles by author see items 4.6-239 and 4.6-240, June 1953, *MAB*.) *Subject Headings*: 1. Radioactivity in the atmosphere 2. Radioactive clouds 3. Puy de Dôme, France.—*W.N.*

6.5-341

551.594.14:551.578.41

Garrigue, Hubert, *Recherches sur la radioactivité de l'atmosphère*. [Investigation of the radioactivity in the atmosphere.] *Académie des Sciences, Paris, Comptes Rendus*, 238(21):2074-2075, May 24, 1954. ref. DWB—Systematic sampling of air at medium flying levels by a new apparatus installed on the S.A.L.S. flying laboratory, was begun on April 11, 1954. On April 24 at 2800 m (9500 ft) over France traces of radioactive dust were obtained over a long period. The synoptic condition (Greenland anticyclone following an Atlantic cyclone and abundant snowfall in mountains) led to the expectation of radioactivity in the snow obtained at Puy de Dôme (1465 m) but the radioactivity over 10 days was only 1/10 the maximum thus far observed in this manner. Unanalyzed samples obtained from lighter snowfall may give different results. *Subject Headings*: 1. Air-borne radioactivity samples 2. Radioactivity of snow 3. Air sampling and analysis 4. Puy de Dôme, France.—*M.R.*

6.5-342

551.594.14:551.510.42

List, R. J., *On the transport of atomic debris in the atmosphere*. *American Meteorological Society, Bulletin*, 35(7):315-325, Sept. 1954. 13 figs., table, 3 refs. MH-BH—Collections of radioactive debris were made daily at 120 Weather Bureau stations throughout the United States during the atomic test series in Nevada in the Spring of 1952. The measuring techniques employed and the meteorological factors involved in the transport and deposition of debris are discussed. Several examples of the relation of computed meteorological trajectories to actual observations of debris are given. *Subject Headings*: 1. Radioactive dust 2. Atomic explosions 3. Transport of radioactive debris 4. United States.—*Author's abstract.*

6.5-343

551.594.14

Lossnitzer, H., *Über meteorologisch bedingte Schwankungen der radioaktiven Umgebungstrahlung*. [Meteorologically conditioned variations in local radioactive radiation.] *Baden. Landeswetterdienst, Jahresbericht mit Abhandlungen*, 1951/1952. p. 154. fig. DWB—A short note showing that the diurnal means of radioactivity observed over 2½ months show variations which can be attributed to meteorological factors (snow cover, precipitation, etc.). *Subject Headings*: 1. Meteorological influences 2. Radioactivity in the atmosphere.—*A.A.*

6.5-344

551.594.14:551.578.46:539

Meinke, W. Wayne (*Dept. of Chemistry, Michigan Univ., Ann Arbor*), *Observations on radioactive snows at Ann Arbor, Michigan*. *Science*, 113(2941):545-546, May 11, 1951. 4 refs. DLC—Careful chemical determinations of radioactive elements found in snow fallen before Jan. 31, and from Jan. 31-Feb. 1, 1954, respectively (tests were made as of Feb. 4) show that ratio of rare earth atoms to Ba-Sr atoms found in the snowpack correspond to what would be expected from atomic fission such as occurred during Las Vegas, Nev., test explosions of Jan. 27-Feb. 6, 1954, and that most of the radioactivity was concentrated in top half (portion fallen Jan. 31 and Feb. 1) and the activity must have originated in explosions of Jan. 27 and/or 28. Later snowfalls (Feb. 4 and 6) show little activity. The greatest amount detected does not approach levels dangerous to health; but does offer possibility of contamination of film packs or of low-background radioactivity experiments. *Subject Headings*: 1. Radioactivity of snow 2. Snowfall radioactivity analysis 3. Atomic explosions 4. Ann Arbor, Mich.—*M.R.*

6.5-345

551.594.14:551.510.42

Nag Choudhury, B. D., **The thermonuclear weapon.** *Science and Culture*, Calcutta, 19(12):575-577, June 1954. DWB—General description of the development, properties and potentialities of thermonuclear bombs. The paper includes brief reference to the possibility of the propagation of radiative dust around the world. *Subject Headings:* 1. Radioactive dust 2. Atomic explosions.—G.T.

6.5-346

551.594.21:551.515.4

Mason, B. J., **Generation of electricity in thunderstorms.** *Electrical Times*, London, 125:159-163, Feb. 4, 1954. 3 figs. DA—The dynamical and electrical structure of thunderstorm cells is described. The complex structure of a lightning flash as revealed by the Boys camera is set out and the development of electric charges examined. Theories of generation of charge are discussed; author's theory that generation is associated with growth of ice pellets in the sub-freezing region is consistent with observations. *Subject Headings:* 1. Thunderstorm electricity 2. Lightning.—C.E.P.B.

6.5-347

551.594.21:551.515.42

Reynolds, S. E. and Neill, H. W., **The distribution and discharge of thunderstorm charge-centers.** *Journal of Meteorology*, 12(1):1-12, Feb. 1955. 9 figs., table, 13 refs. DWB—The magnitude and location of charge centers were determined from gradient change at 11 points on a plateau at 7000 ft in New Mexico. Instrumentation and analysis are described. Records for 18 storms were obtained but only 2 gave appreciable data. After a review of cloud-ground and intra-cloud discharges, it is concluded that a thunderstorm is bipolar, with negative center about 25,000 ft (-16°C) and positive center about 2000 ft higher, but a positive center sometimes occurs below the negative center. Results differ from those of MALAN and SCHONLAND in giving a large horizontal separation between negative charge regions successively tapped, and in the nature of the streamer processes. A model of height distribution of charges in a thundercloud is presented. It is considered that the first discharge was not caused by the glaze-ice mechanism of WORKMAN and REYNOLDS. *Subject Heading:* 1. Thunderstorm electricity.—C.E.P.B.

6.5-348

551.594.6:621.396.821

Chandrashekhar Aiyar, S. V., **Measurement of atmospheric noise interference to broadcasting.** *Journal of Atmospheric and Terrestrial Physics*, 5(4):230-242, Sept. 1954. fig., 15 refs. DWB—Desiderata for measuring standardized noise level in India as a statistical quantity are set out. Measurements of atmospherics give a median duration of 0.18 sec; only 3% exceed 0.5 sec. Ten impulses a minute would affect 10% of broadcast words and is taken as minimum causing annoyance. Noises are classified into 3 types. Subjective results are applied to objective observations with a noise meter and method of statistical analysis is described. *Subject Headings:* 1. Radio noise 2. India.—C.E.P.B.

6.5-349

551.594.6:551.594.221

Hepburn, F. and Pierce, E. T., **Atmospherics with long trains of pulses.** *Philosophical Magazine*, 7 Ser., 45(368):917-932, Sept. 1954. 9 figs., 4 plates, 2 tables, 12 refs. DWB—Long-train sinusoidal atmospherics recorded at Cambridge, England, are classified into 4 types according to symmetry and presence of a slow tail. Height and distance determinations are described and interpretation discussed. "The variation of pulse amplitude with reflection order is shown to lead to the postulation of horizontal radiating elements in the channel during the later stages of the return stroke, although difficulties arise in reconciling this concept with considerations of the magnitude and orientation of the horizontal elements." *Subject Headings:* 1. Radio noise bursts 2. Lightning.—C.E.P.B.

6.5-350

551.594.7:535.32:621.396.11

Jasinski, W. and Berry, J. A., **Measurement of refractive indices of air, nitrogen, oxygen, carbon dioxide and water vapour at 3360 Mc/s.** *Institution of Electrical Engineers, London, Proceedings*, Pt. 3, 101(73):337-343, Sept. 1954. 3 figs., 2 tables, 19 refs., 8 eqs. DWB—Refractive indexes n were measured by resonant frequency of a cavity filled with the gas,

checked by a crystal-controlled frequency standard. Values of $(n-1) \times 10^2$ at 0°C , 760 mm., correct to about ± 0.2 were: Dry air free of CO_2 , 288.3; Nitrogen, 294.5; Oxygen, 266.2; CO_2 , 494.6. Water vapor at 20°C and 10 mm gave 61.3 ± 0.1 . The permanent electric moment of the water molecule was calculated as $(1.845) \times 10^{18}$ e.s.u. *Subject Heading:* 1. Microwave refraction.—*C.E.P.B.*

6.5-351

551.594.7 551.501.81:551.577

Massachusetts Institute of Technology. Dept. of Meteorology, **Weather Radar Research**. Contract DA-36-039-sc-42625, Project DA 3-00-07-022, Project Sc 24-172b, Quarterly Technical Reports, No. 3-4, Dec. 15, 1953 and March 15, 1954. 2 pieces. **DWB**—During the quarter ending Dec. 15, 1953, 17 weather situations were observed and results reported. Five of these were storms which yielded interesting results. Intensity and fluctuation rate measuring techniques were improved through construction of auxiliary apparatus and improvement of the radar turbulence meter. A program was begun for the variable polarization of the radar beam and its effect on precipitation echoes. During the quarter ending March 15, 1954 radar observation and measurements were made on 31 days and partially analyzed. *Subject Headings:* 1. Radar meteorology 2. Radar turbulence meters 3. Radar analysis of precipitation.—*M.R.*

6.5-352

551.594.7:06

Saxton, J. A., **Radio-meteorology. Conference in Texas.** *Nature*, London, 173(4408): 761-764, April 24, 1954. **DWB**—Account of Conference on Radio Meteorology Nov. 9-12, 1953, Texas Univ., Austin. (See item 5.7-3, July 1954, *MAB.*) Under tropospheric wave propagation papers by T. J. CARROLL on abnormal range, W. E. GORDON, on scattering of radio waves and by several authors on refractive index structure, were discussed, as well as papers on propagation research by the National Bureau of Standards, mapping and prediction of wave propagation. Other papers and discussions dealt with thunderstorm and tornado static, cloud and precipitation physics in relation to radar echoes and operational uses of weather radar in detection of storms, fronts and tornadoes, and possible use in forecasting. Some 60 papers were read. *Subject Headings:* 1. Radio meteorology 2. Conferences.—

ACOUSTICAL PHENOMENA

See also: Pressure changes (Met. Mag.), 6.5-174.

6.5-353

551.596.1:534

Gavreau, Vladimir and Miane, Marcel, **Sur la pression de radiation et la nature non-isotrope des pressions acoustiques aux grandes intensités.** [Radiation pressure and the anisotropy of acoustic pressure at great intensities.] *Académie des Sciences, Paris, Comptes Rendus*, 238(22):2148-2150, May 31, 1954. 2 figs. **DWB**—An experimental arrangement designed for determining the pressure of sound radiation is described and illustrated and experiments made with the apparatus are discussed. It is found that sound pressure is anisotropic at high sound intensities. This is attributed to an increase in molecular velocity, which probably also results in an increased speed of propagation of intense sounds. At 145 db, for example, the velocity of 34,700 cm/sec was obtained instead of the theoretical value of 34,000 cm/sec for 20°C . *Subject Headings:* 1. Acoustic pressure 2. Acoustical propagation.—*G.T.*

6.5-354

551.596.1:551.578.46

Oura, Hirobumi, **Reflection of sound at snow surface and mechanism of sound propagation in snow.** *Sapporo. Japan. Hokkaido Univer. Institute of Low Temperature Science, Low Temperature Science*, No. 19:179-186, 1953. fig., table, 4 refs., 15 eqs. In Japanese; English summary p. 186. **DWB**—Analysis of sound propagation through snow indicates that the sound wave is propagated mainly by air in snow and its icy structure only interferes with the propagation. The observed decrease of sound velocity with decrease of snow density is explained by the mechanism of propagation. *Subject Heading:* 1. Acoustical propagation in snow.—*From author's abstract.*

6.5-355

551.596.1:551.578.46

Oura, Hirobumi, **Sound velocity in the snow cover.** *Sapporo. Japan. Hokkaido Univer. Institute of Low Temperature Science, Low Temperature Science*, No. 9:171-178, 1953. fig., 2 tables. In Japanese; English summary p. 176-178. **DWB**—The propagation of sound waves in snow was measured in order to establish a system of snow classification. Two microphones buried in the snow and an explosion was set off in the snow. The time of propagation of the sound wave from one microphone to the other was measured by an electromagnetic oscillograph. The sound paths were (1) in the snow cover only; (2) in the air and in the snow layer; and (3) in the layer of ice crust under the snow layer. Also the propagation of sound through a tube filled with snow was measured with the aid of two microphones and a cathode-ray oscillograph. The velocity of sound through snow is measured by $L=nV/V$, where V is the sound velocity in snow; n a constant and L the distances between the microphones. *Subject Headings: 1. Acoustical propagation in snow 2. Sound velocity 3. Snow classification.* —I.L.D.

6.5-356

551.596.1:551.510.53

Temple University, **Research in the physical properties of the upper atmosphere with V-2 rockets.** Contract W19-122-AC-12, Report No. 15, Oct. 1-Dec. 31, 1951, pub. April 29, 1952. 27 p. 12 figs., 4 refs., 6 eqs. **DWB**—Experimental investigation of the adsorption of sound in air (ambient pressures 1-10 mm Hg, frequencies 18-75 KC). Apparatus used described and theory discussed. The amplitude absorption coefficient deviates from the prediction of theory, being at low pressures smaller in magnitude than the classical values, probably due to a reduction in the effective viscosity. *Subject Headings: 1. Sound absorption 2. Upper atmosphere 3. V-2 rockets.* I. Bohn, J. Lloyd II. Nadig, Francis H.—A.A.

PART II. ANNOTATED BIBLIOGRAPHY ON THE PHOTOCHEMISTRY OF THE UPPER ATMOSPHERE

By: *Geza Thuronyi*

INTRODUCTION

The primary purpose of this bibliography is to give a survey of literature dealing with the chemical reactions taking place in the upper atmosphere under the influence of ultraviolet solar radiation.

A photochemical theory involving oxygen and ozone was developed by Chapman as early as 1931. Since that time several investigators contributed to that theory and today the processes of formation and dissociation of ozone and molecular oxygen may be considered as fairly well established, even if there still remain serious discrepancies between values determined by different authors concerning the quantitative and altitudinal distribution of such processes. In the case of molecular nitrogen no simple photodissociation mechanism, analogous to that of oxygen, is available. Mechanisms suggested by various authors, and resulting calculated distributions of atomic nitrogen differ widely. The possible photochemical reactions involving sodium are closely linked with the problem of the origin of upper-atmospheric sodium. Although numerous theories proposing terrestrial and extraterrestrial sources have been advanced, none has been generally accepted. A similar uncertainty will be found to exist in the case of reactions involving nitrogen compounds, carbon compounds and other possible constituents of the upper atmosphere. Thus it can be stated in general that most of the problems of upper-atmospheric photochemistry are still open for research. It is with the aim of assisting those engaged in such research that this survey of literature has been undertaken.

The material for this bibliography has been selected in accordance with the closely defined subject area: i.e. photochemical processes in the upper atmosphere. Consequently papers emphasizing chemical processes in the lower atmosphere (like a major part of the voluminous ozone literature) or those dealing with chemical composition rather than chemical reactions (including the bulk of the literature on auroral and night-sky spectra) have been excluded. Papers dealing with excitation or ionization mechanisms have been included if directly concerned with chemical changes in the excited or ionized media. However, in view of the affinity of photodissociation and photoionization, a few articles on the latter have been used even though they may not have a direct bearing on the subject of this bibliography.

The subject outline provided below is offered as a guide to the specific topics covered. It is arranged under the following general headings:

1. General reference works and major contributions
2. Chemical constituents of the upper atmosphere
3. Physico-chemical processes
4. Structure and properties of the upper atmosphere
5. Factors producing changes in the upper atmosphere
6. Methods of investigation
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As geographic factors play only an insignificant part in the literature quoted, no outline of geographic places is given. Reference to geographic locations mentioned in this bibliography will be found in the index of this issue (p. 000).

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1930

- 6E-1 551.510.535:541.14
Chapman, Sydney, On ozone and atomic oxygen in the upper atmosphere. *Philosophical Magazine*, 10(64):369-383, Sept. 1930. 4 figs., 27 eqs. DLC—A detailed analysis of the probable mechanism responsible for the variation of ozone and atomic oxygen concentration in the upper atmosphere. By considering dissociation and recombination processes caused by ultraviolet radiation, the author reaches the conclusion that "ozone concentration diminishes rapidly with height above the level of maximum concentration" and "atomic oxygen concentration increases upwards until it exceeds that of molecular oxygen." *Subject Headings*: 1. Ozone density 2. Atomic oxygen density 3. Photochemistry of upper atmosphere.—G.T.

- 6E-2 551.510.535:546.214
Chapman, Sydney, A theory of upper-atmospheric ozone. *Royal Meteorological Society, Memoirs*, 3(26):103-125, June 1930. 13 refs., 49 eqs. DLC—This is the pioneer monograph on the quantitative theory attempting to explain known variations in atmospheric ozone: diffusion, dissociation by solar ultraviolet radiation, decomposition and recombination. The known facts are first enumerated, the reactions set forth, for both formation and disappearance of O_3 , the bimolecular thermal decomposition discussed, two- and three-body reactions, coefficients of reaction, chemical equilibrium of densest part of O_3 layer, diurnal, day to day, seasonal, latitudinal and solar cyclical variations treated in detail. It was assumed that O_3 was uniformly distributed in a 10 km thick layer with no convection or diffusion and thermal decomposition negligible except with 11 year sunspot cycle variations, dissociation of O_2 assumed to be by UV (1300-1800Å) and decomposition of O_3 by 2300 to 2900Å radiation. Day to day variations are slight. *Subject Headings*: 1. Ozone photochemistry 2. Ozone variations.—M.R.

1931

- 6E-3 551.510.535:541.12
Chapman, Sydney, The absorption and dissociative or ionizing effect of monochromatic radiation in an atmosphere on a rotating earth. *Physical Society of London, Proceedings*, 43(236):26-45, 433-501, Jan. 1931. 17 figs., 2 tables, foot-refs., 40 eqs. DLC—The absorption of monochromatic radiation from the sun in an atmosphere of which the density varies exponentially with height is considered; the energy of radiation, or a definite fraction of it is supposed to dissociate or ionize the air, and the dissociation products are supposed to recombine with one another only, and not to diffuse away from the element in which they were formed. The resulting distribution of density of the dissociation products is determined, a constant recombination coefficient being assumed, while account is taken of the variation in rate of dissociation due to the earth's rotation. The results are illustrated by numerous diagrams, showing the density of the dissociation-products as a function of height, time, latitude and season. *Subject Headings*: 1. Ionospheric absorption 2. Recombination coefficient 3. Dissociation rate.—Author's abstract.

- 6E-4 551.510.535:551.594.12:541.14
Chapman, Sydney, Some phenomena of the upper atmosphere. *Royal Society of London, Proceedings, Ser. A*, 132(820):353-374, Aug. 1, 1931. DLC—After presenting a model of the ozone layer (50 km) the lower ionized layer (100 km) and the upper ionized layer (220 km) and absorption of UV in these layers, the author discussed the dissociative effects of solar radiation, the processes of dissociation and recombination of O_2 and O_3 in the ozone layer, ionization by UV radiation, absorption coefficients, maximum electron and corresponding gas densities, levels of ionization, diurnal variations in ionization, and light of night sky (5577Å), chemical and physico-chemical processes are emphasized throughout this comprehensive theoretical study. An attempt is made in every case to find quantitative values of various parameters to support the theories preferred or advanced by the author. *Subject Headings*: 1. Photochemistry of upper atmosphere 2. Ionization in upper atmosphere 3. Oxygen dissociation 4. Ozone dissociation 5. Recombination.—M.R.

- 6E-5 551.510.53:541.14
Mecke, R., The photochemical ozone equilibrium in the atmosphere. *Faraday Society, London, Transactions*, 27(8):375-377, Aug. 1931. figs., refs., 5 eqs. DLC—On the basis of the two primary photochemical reactions $O_3 + h\nu (< \lambda 2655) = O_2' + O'$ and $O_2 + O_2' (< \lambda 2025) = O_3 + O'$ and several secondary reactions (all adding up to photochemical equilibrium of ozone) a relation between atmospheric pressure and ozone concentration is developed. *Subject Headings*: 1. Photochemical equilibrium of ozone 2. Ozone photochemistry.—G.T.

1934

- 6E-6 551.521.4:546.214
Cabannes, Jean, Considérations théoriques sur la luminescence des hautes couches de l'atmosphère. [Luminosity of the higher layers of the atmosphere.] *Académie des Sciences, Paris*,

Comptes Rendus, 199:909-912, Nov. 5, 1934. **DLC**—The observed spectrum of night sky is explained by supposing that the primary cause is the production at a high altitude by an external agency (electron bombardment) of a large number of excited nitrogen molecules N_2^* (8.1 volts above normal state) and of ozone molecules, which then descend to lower altitudes. The luminosity of the night sky is regarded as a sort of phosphorescence in the mixture N_2^* , O_3 , O_2 and H_2O . Thus collision of N_2^* and O_3 may cause dissociation of the O_3 to give metastable O_2 ($^1\Sigma$) and O (^1S), which will then emit the observed band $^1\Sigma \rightarrow ^3\Sigma$ and the observed line $^1S \rightarrow ^1D$ (5577 Å), respectively. Collision of O (^1D) with normal H_2O may excite the latter to vibrate and emit the observed band 6324 Å. Finally collision of O (^1S) with N_2 may excite the latter so as again to cause emission of bands as actually found. *Subject Headings*: 1. Night airglow spectrum 2. Excitation mechanisms 3. Ozone dissociation.—*Physics Abstracts*, No. 198, 1935.

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6E-7

551.521.4

Cabannes, Jean, *La lumière du ciel nocturne*. [Light of the night sky.] *Helvetica Physica Acta*, 8(5):405-420, 1935. 6 figs., 3 refs. **DLC**—The author discusses the results obtained by using a spectroscope having large dispersion and a large aperture and gives details of the wavelengths identified in the regions (1) 5000-8000 Å, and (2) 3800-5100 Å. He identifies bands of N_2 , O_2 and H_2O . These vary in amplitude with a minimum when the earth is in the plane of the solar equator and a maximum when it has the maximum heliographic latitude. The night sky illumination is attributed fractionally as (1) 0.45 by diffusion of solar radiation, (2) 0.30 by rays from feeble stars, and (3) 0.25 from luminosity of the higher atmosphere. The luminous layer is at a height of 200-500 km with the green ray a little lower than the blue. He considers that fast electrons from the sun ionize the highest atmospheric layers and the secondary electrons produced, move in the earth's magnetic field and penetrate to, and illuminate, lower layers. He explains the formation and state of the molecules or atoms of N_2 , O_2 and H_2O which give rise to the many bands and lines seen. *Subject Headings*: 1. Night airglow spectrum 2. Fast electrons.—*Physics Abstracts*, No. 4529, 1935.

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6E-8

551.510.41:546.214551.510.53

Conference on Atmospheric Ozone, Oxford, Sept. 9-11, 1936, Papers read at the Conference. *Royal Meteorological Society, Quarterly Journal*, Supplement to Vol. 62, 1936. 76 p. figs., tables, refs. **DLC**—Twenty-nine papers dealing with various aspects of atmospheric ozone are presented or summarized. The following articles deal with the photochemistry of ozone: Eucken, A. and Patat, F., *Die Temperaturabhängigkeit der photochemischen Ozonbildung*, [Temperature dependence of photochemical ozone formation], p. 45-48; Chapman, Sydney, *Some notes on the theory of atmospheric ozone*, p. 67-68; Eropkin, D., *On the photochemical theory of the formation of ozone*, p. 68-69. *Subject Heading*: 1. Ozone photochemistry.—G.T.

6E-9

551.510.535:551.594.12

Martyn, D. F. and Pulley, O. O., *The temperatures and constituents of the upper atmosphere*. *Royal Society of London, Proceedings, Ser. A*, 154(882):455-486, April 1, 1936. 5 figs., refs., 24 eqs. **DLC**—In a section on "The mechanism of the disappearance of free electrons," the processes involved in the recombination of atomic into molecular oxygen are discussed (p. 474). The recombination $O + O^- = O_2 + e$ (4 volts) is suggested as maintaining night-line ionization of the F layer and giving rise to the green line of night glow. *Subject Headings*: 1. Recombination processes 2. F layer ionization.—G.T.

6E-10

551.510.534:541.14

Wulf, Oliver R. and Deming, Lola S., *The theoretical calculation of the distribution of photochemically-formed ozone in the atmosphere*. *Terrestrial Magnetism and Atmospheric Electricity*, 41(3):299-310, Sept. 1936. 3 figs., table, refs., 14 eqs. **DLC**—An expression is derived for the distribution with height of atmospheric ozone, assuming it to exist in an undisturbed photochemical steady state under the influence of solar radiation considered as that of a black body at a temperature of 6000°K. Approximate values for all the quantities occurring in the expression are either known or computed, with the exception of a numerical constant which is determined from the known total amount of atmospheric ozone, though the order of magnitude of the constant can be shown to be reasonable from existing photochemical data. The distribution of ozone so obtained resembles rather closely that which from observation is now known to be approximately the case. The characteristics of this distribution depend essentially on the distribution of the atmospheric constituents and the character of the oxygen-ozone absorption coefficient curve. A brief discussion is given of some factors not taken into account in the present work. *Subject Headings*: 1. Photochemical theory of ozone 2. Ozone distribution.—*Authors' abstract*.

1937

6E-11

551.521.4

Chapman, S., **Production of auroral and night-sky light.** *Philosophical Magazine*, London, 23, 657-665, April 1937. **DLC**—A theory of the mechanism of the production of the night-sky light is put forward. It is considered that the energy involved is originally derived from sun-light, being stored up during the day mainly in the dissociation of O_2 molecules. The author outlines the ways in which the different observed lines and bands of the night-sky spectrum could be excited by the recombination of O atoms, the third particle necessarily participating being a nitrogen molecule or another oxygen atom and more probably the former. The auroral spectrum, on the other hand, is attributed to strong excitation by impact due to high-speed particles, whether ions or electrons, entering the atmosphere from outside. The presence of lines of atomic N is considered to be very doubtful. *Subject Headings: 1. Oxygen dissociation 2. Night airglow theory.*—*Physics Abstracts*, No. 2014, 1937.

6E-12

551.510.535:537

Massey, H. S. W., **Dissociation, recombination and attachment processes in the upper atmosphere, Pt. 1.** *Royal Society of London, Proceedings, Ser. A*, 163 (915):542-553, Dec. 22, 1937. refs., eqs. **DLC**—The probabilities of various collision reactions which occur in the E and F regions of the ionosphere are considered in general terms. In particular the relative importance of recombination and attachment in effecting electron removal is discussed. As processes in which electrons are detached from negative ions can be expected to go on at a considerable rate (much faster than recombination) and as attachment must also occur very rapidly, the most reasonable representation of the phenomena is to consider the negative ions and electrons as in a dynamical equilibrium adjusting itself rapidly to loss of either by recombination. In this way the usual recombination theory may be retained, even though attachment occurs much more rapidly. A consequence of the theory is that the number of negative ions should considerably exceed the number of electrons in the E region as required by the "dynamo" theory of magnetic variations. The low rate of recombination in the F region, requiring the density of positive ions to be not much greater than that of the electrons, makes it necessary to suppose that, at these levels, the atmospheric gases present are inert towards electron attachment. (For Pt. 2 of this paper see Bates, 1939, item 6E-18.) *Subject Headings: 1. Recombination processes 2. Collisional frequencies 3. Electron attachment 4. Photochemistry of upper atmosphere.*—*Author's abstract.*

1938

6E-13

551.510.535:546.33

Bernard, René, **Sur la formation d'atomes libres de sodium dans la haute atmosphère.** [Formation of free atoms of sodium in the upper atmosphere.] *Académie des Sciences, Paris, Comptes Rendus*, 206 (22):1669-1672, May 30, 1938. refs., eqs. **DLC**—The formation of free atoms of sodium is attributed to the reaction $H + NaCl \rightarrow HCl + Na + 0.22 \text{ eV}$ (5.1, K cal). The atomic hydrogen causing this reaction could be produced with the intervention of metastable nitrogen molecules according to the following formula: $N^2(A^3\Sigma) + H_2O \rightarrow N^2(X^1\Sigma) + OH + H + 1 \text{ eV}$. The hypothesis is substantiated by various experimental and observational results. *Subject Headings: 1. Sodium in upper atmosphere 2. Water vapor dissociation.*—*G.T.*

6E-14

551.510.535:537.536

Bradbury, Norris E., **Ionization, negative-ion formation, and recombination in the ionosphere.** *Terrestrial Magnetism and Atmospheric Electricity*, 43 (1):55-66, March 1938. 2 figs., 3 tables, 12 refs., 11 eqs. **DLC**—The ionization in the ionosphere is discussed in the light of present theories of recombination and negative-ion formation. It is suggested that the E and F1 regions are formed as the result of the absorption of special bands of solar radiation and that negative-ion formation is the predominant process in these regions. A sufficient number of electrons exists, however, to cause the reflection of electromagnetic waves. The F2 region is probably not due to the absorption of any special band of solar radiation but owes its formation to the preponderance at this elevation of electron-positive-ion recombination over negative-ion formation during the day. The characteristics of the E and F1 regions are discussed quantitatively and compared with experimental observations. A qualitative discussion is given for the F2 region since it seems probable that significant changes in level and density take place at these elevations. *Subject Headings: 1. Ionospheric ionization 2. Recombination.*—*Author's abstract.*

6E-15

551.510.535:539

Majumdar, R. C., **The theory of molecular dissociation and the fundamental mechanisms in upper atmosphere.** *Indian Journal of Physics*, 12 (1):75-86, March 1938. 14 refs., 25 eqs. **DLC**—A theoretical formula is developed to estimate the degree of molecular dissociation in the upper

atmosphere under the action of the ultraviolet light of the sun. The dissociation of oxygen and nitrogen molecules is discussed; it is found that oxygen molecules are completely dissociated at a height of about 167 km, i.e., much above the E region of the ionosphere, provided that a temperature of 300°K and a molecular weight corresponding to the average mass of nitrogen molecules are assumed. The constituents as well as the mechanism of the fundamental processes in the ionosphere are discussed. *Subject Headings:* 1. Nitrogen dissociation 2. Oxygen dissociation 3. Upper atmosphere.—*Author's abstract.*

6E-16

551.510.41:551.510.53

Penndorf, R., *Die Zusammensetzung der Luft in der hohen Atmosphäre*. [Chemical composition of the upper atmosphere.] *Meteorologische Zeitschrift*, 55(1):28-31, Jan. 1938. 2 figs. **DWB**—From results achieved by direct methods (sampling in stratosphere balloon ascents) and indirect methods (especially spectroscopy), atmospheric composition and temperature are determined up to a height of over 250 km. Molecular oxygen is shown to be completely dissociated above 100 km, whereas nitrogen above 100 km appears in the form of N_2 , N_2^+ and N. Diffusive separation leads to a decrease of oxygen content and increase of helium content from 15 km upward. *Subject Headings:* 1. Chemical composition of upper atmosphere 2. Oxygen dissociation.—*G.T.*

6E-17

551.594.12:539

Wulf, Oliver R. and Deming, Lola S., *On the production of the ionospheric regions E and F and the lower-altitude ionization causing radio fade-outs*. *Terrestrial Magnetism and Atmospheric Electricity*, 43(3):283-298, Sept. 1938. figs., 22 refs. **DLC**—Dispersion-measurements in nitrogen indicate two absorptions due to this gas in the far-ultraviolet, the positions of which are compared with spectroscopic data. These absorptions with two other absorptions due to oxygen and nitrogen atoms produced by the primary molecular absorptions, are utilized in attempting to account for the normal ionosphere. It is concluded that the ionization producing radio fade-outs probably cannot be due to a far ultra-violet radiation because of its remarkably low altitude and its intensity, and that such ionization seems to require the presence of a new constituent, not present at greater heights, which possesses broad absorption in the near ultra-violet. It is considered possible that radiation absorbed by ozone produces this ionization. *Subject Headings:* 1. Ionospheric ionization 2. Oxygen dissociation 3. Nitrogen dissociation.—*From author's abstract.*

1939

6E-18

551.510.535:541.12

Bates, D. R.; Buckingham, R. A.; Massey, H. S. W. and Unwin, J. J., *Dissociation, recombination and attachment processes in the upper atmosphere, Pt. 2. The rate of recombination*. *Royal Society of London, Proceedings, Ser. A*, 170(942):322-340, April 3, 1939. 2 figs., refs., 28 eqs. **DLC**—On the basis of the theory developed in a previous paper (see item 6E-12 above), the effective recombination coefficient for electrons in the E and F regions is given by $\alpha_e + \lambda\alpha_e$, where α_e is the actual recombination coefficient for electrons, α_e ; that for ions and λ the negative ion-electron ratio which, apart from small daily variations, remains constant. In this paper the contribution to α_e arising from radiative recombination is evaluated by quantal methods, account being taken of the fact that an electron may recombine into any excited state of the positive ion. It is found that this process is entirely inadequate to account for the observed recombination in both E and F regions. Other possibilities are discussed and reasons are given for supposing that two-body recombination of negative and positive ions, exemplified by $O^+ + O^- \rightarrow O' + O''$, is the most likely source of the observed recombination. At the same time the ratio λ must be between 100 and 1000 for E region and between 10 and 50 for F. Such values for E have also been suggested from terrestrial magnetic variations. Lower values for F may be due to temperature ionization of negative ions or to inert constituents at F layer heights. The continuous absorption coefficient of atomic oxygen is also calculated. *Subject Headings:* 1. Photoionization of oxygen 2. Recombination coefficient 3. Recombination processes 4. Ionosphere.—*Authors' abstract.*

6E-19

551.521.4:539

Cabannes, Jean, *Quelques remarques sur la luminescence du ciel nocturne*. [Some remarks on the brightness of the night sky.] *Académie des Sciences, Paris, Comptes Rendus*, 208:1170-1172, June 5, 1939. foot-refs. **DLC**—CHAPMAN's theory of the night-sky illumination being due to dissociation of the molecule O_2 in the day and its recombination at night is favored. The changes in atomic levels suggested by CHAPMAN and MARTYN to explain the presence of the green ray and red doublet are examined and changes in these views are suggested. A new explanation is given for the upper levels of the principal bands observed. The exceptional intensity of the band 6500-6550Å is considered to be due to collision of the molecule N_2 and the atom O. Only part of the atoms emit the ray 5577Å and the ratio of the intensities of the band and ray is a function of the density

of the air. *Subject Headings:* 1. Oxygen dissociation 2. Night airglow theory.—*Physics Abstracts*, No. 3215, 1939.

6E-20 551.521.4:537.568

Cabannes, Jean and Aynard, Rose, *Sur les conditions d'excitation du spectre de l'azote dans la haute atmosphère*. [On the mode of excitation of the nitrogen spectrum in the upper atmosphere.] *Journal de Physique et le Radium*, Ser. 7, 10(11):455-458, Nov. 1939. fig., 9 refs., eqs. **DLC**—Attempts to determine the mode of excitation of the molecular nitrogen spectrum in the nightglow. The problem is to explain why the upper states of the Vegard-Kaplan bands (strongest in intensity) have a vibration quantum of $v=2$ or $v=3$. The energy liberated by recombination of oxygen atoms during the night is considered. It is assumed that such a recombination takes place by three-body collision with a nitrogen molecule, and that the available energy is distributed among the O_2 and N_2 molecules. Various possible mechanisms of this hypothesis, and laboratory experiments which appear to support it, are discussed. Finally, the considerable rise in the state of the 6500-6550Å band of the first positive system is explained. *Subject Headings:* 1. Night airglow theory 2. Recombination processes.—*Trans. of authors' abstract*.

6E-21 551.510.535:546.33

Chapman, Sydney, *Notes on atmospheric sodium*. *Astrophysical Journal*, 90(2):309-316, Sept. 1939. refs., 3 eqs. **DLC**—It is suggested that sodium atoms in the high atmosphere may have a long, though intermittent, free life, despite frequent combination with oxygen atoms to form NaO, through the reaction $NaO + O = Na + O_2$. The source of energy of the light emitted by sodium at night is ascribed to the dissociation energy of oxygen. The level of emission of this light is also discussed. *Subject Headings:* 1. Sodium in upper atmosphere 2. Oxygen dissociation 3. Night airglow theory.—*Author's abstract*.

6E-22 551.510.536:541.41

Mitra, Sisir Kumar and Banerjee, A. K., *The fringe of the atmosphere and the ultraviolet light theory of aurora and magnetic disturbances*. *Indian Journal of Physics*, Calcutta, 13(2):107-144, April 1939. 7 figs., 5 tables, 27 refs., 29 eqs. **DLC**—This is one of the first attempts to integrate systematically all of the theory and experimental data to form a model of the atmosphere to 1000 km and to explain the processes in the upper atmosphere (>100 km) and especially in the fringe or spray region. Above 770 km the oxygen atoms would rarely collide with each other, but are inhibited from escaping if ionized by UV light, since ionized particles require a velocity of 2.5×10^6 km/sec to escape by disentangling from the earth's magnetic field, whereas un-ionized particles require a velocity of only 11 km/sec at 7000 km to escape. The natural limit of the atmosphere, critical level, effect of ionization, rotation of earth (viscous drag), extension of fringe region by super-elastic collision, sources of super-elastic collision, calculation of number of metastable oxygen atoms, average molecular density and various aspects of auroral physics are treated. *Subject Headings:* 1. Photochemistry of upper atmosphere 2. Exosphere 3. Ultraviolet theory of aurora.—*M.R.*

1940

6E-23 551.510.535:537.568

Möhler, Fred, *Recombination and electron attachment in the F layers of the ionosphere*. *U. S. National Bureau of Standards, Journal of Research*, 25(5):507-518, Nov. 1940. 16 refs., 27 eqs. **DLC**—Using data on the critical frequency of the F2 layer obtained at Washington in 1938 (maximum solar activity), the theory of recombination as it affects the level of highest electron concentration in the F region is tested, resulting in conclusion that rate of recombination decreases rapidly with decreasing pressure above F1 and as a consequence the maximum number of electrons is located for above the level where the rate of production is at a maximum in mid-summer. Diurnal, seasonal and solar activity fluctuations in recombination coefficient are also considered. Seasonal variation in electron concentration can be explained by change in pressure. Pressure changes also account for sunspot cycle changes in F2 concentration. *Subject Headings:* 1. Recombination in F region 2. F2 layer electron density.—*M.R.*

6E-24 551.510.535

Pekeris, C. L., *The vertical distribution of ionization in the upper atmosphere*. *Terrestrial Magnetism and Atmospheric Electricity*, 45(2):205-211, June 1940. 4 figs., 2 tables, 10 refs., 27 eqs. **DLC**—In the last section of this paper a formula is derived for determining the vertical distribution of electron collision frequency from simultaneous measurements of the reflection coefficient as a function of frequency. *Subject Headings:* 1. Electron collision frequencies 2. Ionospheric ionization.—*From author's abstract*.

1941

6E-25

551.510.535:539

Gauzit, Junior, **La présence de raies interdites dans les spectres du ciel nocturne et de l'aurore et la constitution de l'atmosphère supérieure.** [The presence of forbidden lines in night sky and auroral spectra and the composition of the upper atmosphere.] *Académie des Sciences, Paris Comptes Rendus*, 213(20):695-697, Nov. 17, 1941. refs. **DLC**—The presence of molecular oxygen at the altitude of excitation of forbidden lines in auroral and night sky spectra (about 100 km) would considerably reduce the intensity of those lines. It is therefore concluded that both oxygen and nitrogen molecules are almost completely dissociated above 100 km. *Subject Headings:* 1. Oxygen dissociation 2. Nitrogen dissociation.—G.T.

1942

6E-26

551.510.535:539

Gauzit, Junior, **Constitution de l'atmosphère supérieure: dissociation des molécules d'oxygène et d'azote.** [The composition of the upper atmosphere according to the dissociation of oxygen and nitrogen molecules.] *Cahiers de Physique*, No. 9:47-61, Aug. 1942. 3 figs., 2 tables, 25 refs. Abridged English version in: *American Meteorological Society, Bulletin*, 25(6):245-250, June 1944. 2 figs., table, refs. **DLC**—The presence of forbidden lines in the spectra of the night sky and of aurorae requires that the upper atmosphere be composed essentially of atomic oxygen and nitrogen. The transition between molecular and atomic regions is sudden and is found for both cases towards the height of 100 km. The absorption of ultraviolet solar radiation undoubtedly decomposes the oxygen molecules of the upper atmosphere, but the dissociation of nitrogen is harder to understand. Molecular recombination by triple collisions being unusual in the upper altitudes, we can understand that a weak dissociative source is able to maintain the atomic state of upper atmospheric layers: the most probable one is photochemical dissociation, but the effect is important only when the temperature rises above 1000°K. *Subject Headings:* 1. Oxygen dissociation 2. Nitrogen dissociation.—*Author's abstract.*

6E-27

551.510.535:551.521.4:535.33

Jouaust, Raymond, **Les origines de la couche E de l'ionosphère.** [Origin of the ionospheric E layer.] *Académie des Sciences, Paris, Comptes Rendus*, 214(9):441-442, March 2, 1942. 3 refs. **DLC**—Night sky spectra indicate the presence of metastable O(¹S) atoms around 100 km altitude. These may be formed by three-body collision of oxygen atoms in the O(³P) state. Since such three-body collision necessitates highest collision frequency, it will take place in the lower ionospheric region. The same conclusion can be drawn from auroral spectra. *Subject Headings:* 1. E layer origin 2. Night airglow spectrum.—G.T.

1943

6E-28

541.14

Bamford, C. H., **Photochemical processes in an oxygen-nitrogen atmosphere.** *Physical Society of London, Reports on Progress in Physics*, 9:75-91, 1942/43, pub. 1943. figs., refs., 59 eqs. **DLC**—A review of photochemical reactions observed in the laboratory and possibly taking place in the atmosphere. The mechanisms described involve photochemistry of oxygen, ozone, nitrous oxide, nitrogen peroxide, and nitrogen pentoxide, and reactions between these gases. It is made clear that there are serious limitations to the applicability of the laboratory results to upper atmospheric conditions. *Subject Headings:* 1. Photochemistry 2. Review articles.—G.T.

6E-29

551.594.12

Bates, D. R. and Massey, H. S. W., **The negative ions of atomic and molecular oxygen.** *Royal Society of London, Philosophical Transactions, Ser. A*, 239(806):269-304, April 2, 1943. 7 figs., 4 tables, refs., 53 eqs. **DLC**—A thorough analysis of processes involving (a) negative ions formed by and from atomic oxygen (elastic scattering, radiative attachment of slow electrons, photo-detachment of electrons, direct radiative process, dielectronic attachment, three-body processes); (b) negative ions formed by and from molecular oxygen (electronic states of O₂, direct radiative attachment and photodetachment); (c) production and mutual neutralization of pairs of positive and negative ions. The study is based on available experimental information interpreted and supplemented by deduction suggested by quantum theory. *Subject Headings:* 1. Electronic processes 2. Ionization processes.—G.T.

6E-30

551.510.534:541.14

Chapman, Sydney, **The photochemistry of atmospheric oxygen.** *Physical Society of London, Reports on Progress in Physics*, 9:92-100, 1942/43, pub. 1943. refs., 22 eqs. **DLC**—Reviews

photochemical ozone theories of CHAPMAN, MECKE and WULF-DEMING. The theories reviewed concern photolysis by the absorption of sunlight, photochemical equilibrium and daily, seasonal and latitudinal variations of ozone density. *Subject Headings:* 1. Photochemical theory of ozone 2. Ozone photochemistry 3. Ozone density variations.—G.T.

6E-31 551.510.535

Gauzit, Junior, *Sur l'origine de la couche ionosphérique E*. [Origin of the ionospheric E layer.] *Académie des Sciences, Paris, Comptes Rendus*, 217:179-181, 1943. DLC—A mechanism of recombination is proposed according to which an ionized O_2 molecule and an electron is formed by the collision of two metastable O atoms as follows: $O(^1S) + O(^1S) \rightarrow O_2^+(x^2II) + \text{electron}$. This reaction is believed to take place at the altitude of the E layer. A relation may exist between E layer ionization and the green line in the night sky spectrum, both phenomena depending on the concentration of $O(^1S)$ atoms in the upper atmosphere. *Subject Headings:* 1. E layer origin 2. Recombination processes.—G.T.

6E-32 551.510.535:525.75

Ghosh, S. N., *A comparison of the variations of night-sky luminescence and of region-F electron density at night*. *Science and Culture*, Calcutta, 9(4):170-172, Oct. 1943. 4 refs. DLC—The lack of correlation between F layer electron density at night and the intensity of night-sky emission is attributed to the fact that, whereas the ionospheric measurements refer to the region of maximum ionization, the optical phenomena depend on the total number of ions present in the region. If MITRA's reaction (1948) between N_2^+ and O^- is accepted, the intensity of emission will be far less variable than the maximum ion density, as is in fact observed. *Subject Headings:* 1. Electron density 2. Night airglow 3. F2 layer.—*Physics Abstracts*, No. 1266, 1944.

6E-33 551.510.535:537

Massey, H. S. W. and Bates, D. R., *The properties of neutral and ionized atomic oxygen and their influence on the upper atmosphere*. *Physical Society of London, Reports on Progress in Physics*, 9:62-74, 1942/43, pub. 1943. 5 tables, 31 refs., 10 eqs. DLC—Purpose of report is to summarize the information at present available, mainly from theoretical sources, concerning the properties of O, O^+ and O^- . The first section deals with the electronic structure, energy levels and line spectra of O, O^+ and O^- , considering, in particular, the metastable levels and the so-called forbidden lines. In the second section collision processes involving the neutral atom, photoionization (continuous absorption), elastic scattering of electrons by O atoms, and deactivation of metastable O atoms by electron collision are discussed. The recombination of electrons with O^+ ions is the subject of the third section, while the fourth is concerned with modes of formation and destruction of O^- ions. Mutual neutralization on collision of O^+ and O^- is considered in the fifth section. The concluding section deals briefly with applications to the theory of the origin of ionized layers, of the rate of ionospheric recombination and of the origin of night sky light. *Subject Headings:* 1. Collision processes 2. Recombination processes 3. Photochemistry of upper atmosphere 4. Ionization processes.—*From authors' introduction*.

6E-34 551.521.4:535.33

Mitra, S. K., *Light of the night sky*. *Science and Culture*, Calcutta, 9(1):46-48, July 1943. 13 refs. DLC—Notes failure of various hypotheses to explain mode of excitation of spectral lines and bands in the night sky spectrum, particularly in regard to green radiation. Then proposes a simple process of ionic recombination between negative ions of oxygen atoms and positive N_2 ions by electric transfer to explain the excitation of O lines and N_2 bands: $N_2^+(X') + O^- \rightarrow N_2$ (excited) + O (excited). *Subject Headings:* 1. Night airglow spectrum 2. Recombination processes.—M.L.R.

6E-35 551.510.535:551.594.12

Sayers, J., *Ionization phenomena in the earth's atmosphere*. *Physical Society of London, Reports on Progress in Physics*, 9:52-61, 1942/43, pub. 1943. fig., ref., 26 eqs. DLC—Electron detachment processes (such as $O^- + O \rightarrow O_2 + e$; $O^- + N \rightarrow NO + e$ or $O^- + N_2 \rightarrow N_2O + e$) to which a major effect on the night-time ionization balance is attributed, are analyzed theoretically. Results of radio observations of recombination in the E layer are compared with laboratory experiments. F layer recombination is also discussed. *Subject Headings:* 1. Ionospheric ionization 2. Electronic phenomena 3. Photochemistry of upper atmosphere.—G.T.

6E-36 551.510.535:525.75

Wu, Ta-you, *Excitation processes in the night sky and aurora*. *Indian Academy of Sciences, Bangalore, Proceedings, Ser. A*, 18(1):40, 66, July 1943. 2 figs., 2 tables, refs., 19 eqs. DLC—The emission spectra of the night sky and aurora, and especially the intensity distributions and diurnal variations, are explained on the view that all the excitation and quenching processes in the upper

atmosphere are collisions of the second kind between metastable atoms and molecules of N_2 and O_2 . Photodissociation of molecules during the day forms normal atoms which recombine to form metastable molecules whose collisions produce the metastable atoms. The max. energy available in these latter is only 6.1 eV, so that the atomic lines of N, O, H and the rare gases are not excited. *Subject Headings: 1. Photochemistry of upper atmosphere 2. Excitation mechanisms 3. Night airglow theory 4. Auroral theories.—Physics Abstracts, No. 753, 1944.*

1944

6E-37

551.521.4:546.33

Bricard, Jean and Kastler, Alfred, *Recherches sur la radiation D du sodium dans la lumière du ciel crépusculaire et nocturne*. [Investigation of the D line of sodium in the light of the twilight and night sky.] *Annales de Géophysique*, 1(1):53-91, Aug. 1944. 16 figs., 4 tables, 40 refs., eqs. **DLC**—A detailed discussion of quantitative determination of D-line absorption by atmospheric sodium. Instrumentation and method of measurement are described and data reported. On p. 30 the authors consider the possible photochemical processes responsible for the presence of a large number of free sodium atoms at an altitude near 74 km. *Subject Headings: 1. Night airglow 2. Sodium D line 3. Photochemistry of upper atmosphere 4. Sodium in upper atmosphere.—G.T.*

6E-38

539.132:546.17

Gaydon, A. G., *Dissociation energy of nitrogen*. *Nature*, London, 153(3883):407-408, April 1, 1944. 3 refs. **DLC**—Laboratory experiments indicate that by introducing the predissociation concept the dissociation energy of nitrogen will be found to be 9.764 eV rather than the general accepted 7.383 eV. The dissociation energy of nitric oxide accordingly is 6.49 eV instead of 5.29 eV. *Subject Heading: 1. Nitrogen dissociation.—G.T.*

6E-39

551.510.41

Wu, Ta-you, *On the existence of atomic nitrogen in the upper atmosphere of the earth*. *Physical Review*, 66(3/4):65-68, Aug. 1/15, 1944. refs., 9 eqs. **DLC**—Evidence for the existence of atomic nitrogen in the upper atmosphere is presented. It is shown that the absence of certain lines of NI and the absence of continuous absorption which leads to the dissociation of N_2 cannot be considered conclusive evidence against the existence of atomic nitrogen. Relative densities of the E and F layers are discussed, and it is shown that observations of high density in the F layer may be compatible with the existence of atomic nitrogen. Possible transitions which produce the night sky spectrum are discussed. *Subject Headings: 1. Atomic nitrogen in upper atmosphere 2. Night airglow spectrum.—Author's abstract.*

1945

6E-40

551.524.7:541.14

Gauzit, Junior, *La température de l'atmosphère supérieure et la dissociation photochimique de molécules d'oxygène*. [Temperature of the upper atmosphere and photochemical dissociation of molecular oxygen.] *Annales de Géophysique*, 1(3):233-243, Dec. 1945. fig., 15 eqs. **DLC**—Temperature in the upper atmosphere is calculated on the basis of collisional frequencies following the formation of high velocity atoms by photochemical dissociation of oxygen. *Subject Headings: 1. Upper air temperatures 2. Oxygen dissociation 3. Collisional frequencies.—G.T.*

6E-41

551.510.535:541.14

Kiepenheuer, K. O., *Sur l'intensité absolue et les lois du rayonnement ultraviolet qui produit l'ionosphère*. [Absolute intensity and laws of the ultraviolet radiation which produces the ionosphere.] *Annales d'Astrophysique*, 8(3/4):210-242, July/Oct. 1945. 7 figs., 6 tables, 27 refs., 81 eqs. **DLC**—Basic photochemical processes in the ionosphere involving atomic and molecular oxygen and nitrogen (ionization, dissociation, recombination, electron attachment and detachment) are expressed in terms of energy quanta. From the energy balance thus obtained, the author develops relations between combined frequencies of the various ionospheric layers and the amount of ionizing solar radiation. The correlation between ionizing radiation and relative sunspot number is discussed. *Subject Headings: 1. Photochemistry of upper atmosphere 2. Ionospheric ionization.—G.T.*

6E-42

551.510.535

Nicolet, Marcel, *Contribution à l'étude de la structure de l'ionosphère*. [Contribution to the study of ionospheric structure.] *Belgium. Institut Royal Météorologique, Mémoires*, vol. 19, 1945. 162 p. 15 figs., table, refs., 423 eqs. **DWB**—Deals extensively with solar radiation, structure and composition of the earth's atmosphere, physics of the ionosphere. Oxygen dissociation and recombination processes and the equation of photochemical equilibrium are discussed on p. 70-76;

association of N_2 and formation of NO on p. 81-84. The presence of helium in the upper atmosphere is postulated (p. 84-87). The mechanism of the formation of ionospheric layers is thoroughly analyzed in Ch. 5 (p. 106-148). *Subject Headings:* 1. Oxygen dissociation 2. Recombination processes 3. Nitrogen dissociation 4. Helium in upper atmosphere.—G.T.

6E-43

551.521.61:551.593.9

Stebbins, Joel; Whitford, A. E. and Swings, P., **A strong infrared radiation from molecular nitrogen in the night sky.** *Astrophysical Journal*, 101:39-46, Jan. 1945. fig., 3 tables, refs. **DLC**—Radiation from the night sky at $10\,440 \pm 25$ Å, discovered photoelectrically in the course of a spectrophotometric study of stars and nebulae, is found to be very much stronger than the line at 5 577 Å. The wave length was determined from the relative transmissions through a series of filters, since spectrography would be impossibly slow. The radiation is identified with the (O,O) band of the first positive group of N_2 . The absence of other N_2 bands suggests a mechanism involving conversion of the dissociation energy of N_2 into excitation via a 3-body collision. This mechanism implies the presence of photo-dissociated N atoms in the upper atmosphere, supplied possibly by a re-dissociation effect. It is effective only if the Herzberg-Sponer value of 7.38 eV is correct for the dissociation energy of N_2 . *Subject Headings:* 1. Nitrogen dissociation 2. Night airglow spectrum. —*Physics Abstracts*, No. 3137, 1945.

6E-44

551.510.535

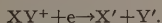
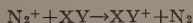
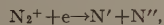
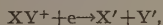
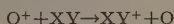
Wu, Ta-you, **Recombination-processes in the E layer of the ionosphere.** *Terrestrial Magnetism and Atmospheric Electricity*, 50(1):57-62, March 1945. 8 refs., 25 eqs. **DLC**—It is shown that photo-ionization of the negative ion of oxygen leads to a low value for the ratio λ of the concentrations of the negative ion and the electron ($[O^-]/[e]$). Hence the observed high value $\sim 10^{-8}$ cm³/sec (compared with the theoretical value $\sim 10^{-12}$ cm³/sec) for the daytime effective recombination-coefficient a' in the E layer cannot be ascribed to a high value of λ (10^2-10^3). It is suggested that in order to explain the observed a' , one abandon the usual assumption that the E layer is electrically neutral and postulate instead a preponderance of positive over negative charge so that $[O^+] + [O_2^+] \approx 10^3 [e]$. Such a concentration of positive ions is consistent with what is demanded by the Stewart-Schuster-Chapman theory for the diurnal variation of terrestrial magnetism. Nighttime conditions in the E layer are also discussed. The rise of electron-density before sunrise is explained. *Subject Headings:* 1. Recombination processes 2. Ionization processes 3. E layer recombination.—*Author's abstract*.

1946

6E-45

551.510.535:537.568

Bates, D. R. and Massey, H. S. W., **The basic reactions in the upper atmosphere.** Pt. I. *Royal Society of London, Proceedings, Ser. A*, 187(1010):261-296, Nov. 5, 1946. 5 tables, refs., 10 eqs. Pt. II, *Ibid.*, 192(1028):1-16, Dec. 23, 1947. 3 figs., refs., 30 eqs. **DLC**—In Pt. I the properties of the ionosphere are discussed with emphasis on the ionization mechanisms and electron equilibrium. Theories on the origin of night airglow are reviewed. In Pt. II the dust recombination theory and the molecular recombination theory are analyzed. It is shown that only the latter is promising. The following mechanism is proposed for E layer recombination: $O_2^+ + e \rightarrow O' + O'$. For the F1 layer the reactions suggested are:



Subject Headings: 1. Photoionization 2. Recombination processes.—G.T.

6E-46

551.521.4

Bates, D. R., **The origin of the night sky light.** *Royal Astronomical Society, London, Monthly Notices*, 106(6):509-514, 1946. **DLC**—The theory is advanced that night sky emission "is not solely connected with the potential energy associated with the region of dissociated oxygen or with the ionized layers" as suggested by CHAPMAN and MITRA-GHOSH, respectively, but is partly caused by charged particles penetrating into the atmosphere. *Subject Heading:* 1. Night airglow theory. —G.T.

6E-47

551.510.41:541.14

Dütsch, Hans-Ulrich, **Photochemische Theorie des atmosphärischen Ozons unter Berücksichtigung von Nichtgleichgewicht-Zuständen und Luftbewegungen.** [Photochemical theory of atmospheric ozone in consideration of the state of non-equilibrium and air movements.] Zürich: Leeman & Co., 1946. 113 p. 8 figs., 36 tables, refs. **MH-BH**—In the chapter on the theory of photochemical ozone formation and dissociation (p. 16-31), primary and secondary photochemical reactions involving oxygen and ozone are indicated. Rates of dissociation and recombination and absorption coefficients are discussed. (Same item as 2-62, Feb. 1950, *MAB*.) *Subject Headings*: 1. Photochemical equilibrium of ozone 2. Ozone photochemistry.—G.T.

6E-48

551.510.3:546.33

*†Khvostikov, I. A., **Natrii v stratosfere.** [Sodium in the stratosphere.] *Uspekhi Fizicheskikh Nauk*, Moscow, 30(3/4):184-244, 1946. 29 figs., 8 tables, 83 refs., eqs. **DLC**—A comprehensive survey of knowledge of atomic Na in the upper atmosphere as gained from spectroscopy. Methods and results of spectroscopic observations are described and illustrated. Height determination and relation to ozone layer are thoroughly treated, and in Ch. 7 chemical processes whereby NaCl is transformed by photodissociation and Na reacts with O or O₂ to give NaO with primary or secondary luminescent effects are discussed. Later chapters cover sources of Na in upper atmosphere, total amount in atmosphere, D-line character and absorption, seasonal variations in yellow line and relation to ionosphere and, finally, the structure of the atmosphere to 150 km. Extensive list of references without titles appended. *Subject Headings*: 1. Sodium in upper atmosphere 2. Twilight sodium spectrum.—M.R.

6E-49

551.510.535:551.594.12

Woolley, R. v. d. R., **The mechanism of ionospheric ionization.** *Royal Society of London, Proceedings, Ser. A*, 187(1008):102-114, Oct. 8, 1946. refs. eqs. Article duplicated in toto, *Ibid.*, 187(1011):403-415, Dec. 13, 1946. **DLC**—The available mechanisms for the production of electrons in the three regions of the ionosphere are discussed with special reference to the question whether it is possible to account for the observed electron densities without supposing that the sun emits far more energy in the remote ultra-violet spectrum than would be emitted by a black body at 6000°. The contributions to electron densities made by metastable states of atoms and molecules are examined. It is concluded that the observed electron densities may be accounted for without requiring high solar energy in the ultra-violet if the effective recombination coefficient in the F2 region is 10⁻¹¹. The F2 region is attributed to the ionization of atomic oxygen and the E region to the ionization of molecular oxygen. The electrons forming the F1 region are supposed to be provided by metastable N₂ or by NO. *Subject Headings*: 1. Ionization processes 2. Recombination coefficient 3. Electron density.—Author's abstract.

1947

6E-50

551.510.535:551.501.7:551.507.362

Beth, Eric Walter, **Discussion of a method for the investigation of pressure, temperature, average molecular weight, wind velocity and dissociation in the upper atmosphere.** *U. S. Air Force. Air Materiel Command, Report*, No. 5 10, July 22, 1947. 39 p. tables. **DWB**—Details of theoretical method for calculating wind velocity, etc. from pressure and temperature data obtained during rocket flights to 100 km or so, based on data presented in paper by DOW and REIFMAN (1946). Effects of various atmospheric constituents, and determination of dissociation by this method also discussed. Effect of projectile is taken into consideration. (Same item as 3.10-32, Oct. 1952, *MAB*.) *Subject Headings*: 1. Rocket measurements 2. Upper atmosphere 3. Dissociation. I. Dow, W. G. II. Reifman, Alfred.—M.R.

6E-51

551.510.535:551.594.12

Rakshit, H., **Distribution of molecular and atomic oxygen in the upper atmosphere.** *Indian Journal of Physics*, 21(2):57-68, April 1947. fig., 3 tables, refs., 15 eqs. **DLC**—An attempt is made to determine the distribution of molecular and atomic oxygen with height by adapting PANNEKOEK's method of studying the distribution of ionization in the earth's atmosphere by the action of solar ultraviolet radiation. The method in its essentials is the same as that adopted by MAJUMDAR (1938). (See item 6E-15.) It is found that the density of O₂ molecules decreases very rapidly with height above 100 km. The density of O atoms at night due to recombination is also considered. It is shown that the atoms will be in sufficient density at night to emit the green radiation with the observed density. *Subject Headings*: 1. Ionospheric ionization 2. Ultraviolet radiation 3. Oxygen dissociation.—From author's abstract.

6E-52

551.524.7:541.12

Seaton, S. L., **Temperature and recombination coefficient in the ionosphere.** *Journal of Meteorology*, 4(6):197-200, Dec. 1947. 8 figs., refs., 6 eqs. **DLC**—Methods are developed for

evaluating from experimental data the recombination coefficient between electrons and positive ions throughout the 24 hours in the ionosphere. Values of the recombination coefficient so determined are applied to calculation of ionospheric temperature from Thomson's relationship. Adoption of suitable reference temperatures and corresponding recombination coefficients is discussed. Composite atmospheric temperatures at noon are given for equinoctial period at the equator during inspot minimum. Highest temperatures, of the order of 600K, are found at the height of 100 km. Noon temperatures in the region 200–400 km appear to be of the order of 200K to 250K. *Subject Headings: 1. Recombination coefficient 2. Upper air temperatures.—Author's abstract.*

6E-53

551.510.535 551.521:523.1

Woolley, R. v. d. R., **Radiative equilibrium in the ionosphere.** *Royal Society of London, Proceedings, Ser. A*, 189 (1017):218–240, April 17, 1947. fig., 2 tables, ref., eqs. **DLC**—The equations of radiative equilibrium in the earth's atmosphere are examined with special reference to high temperatures in the ionosphere arising out of a radiation balance between heavy ultra-violet absorption in the ultra-violet and relatively weak infra-red emission. It is suggested that while molecular oxygen is the principal ultra-violet absorption agent at heights below 250 km, at greater heights the absorption is mainly due to atomic oxygen. Similarly, it is suggested that while water vapor is the principal infra-red radiator at a height of 100 km, at much greater heights water vapor is absent and the temperature is effectively controlled by negative ions at a height of 250 km and perhaps by dust at much greater heights. The gravitational equilibrium of a dissociating oxygen atmosphere is discussed, reference being made to the effects of collisions and of absorption of the dissociating radiation. *Subject Headings: 1. Ultraviolet light absorption 2. Oxygen dissociation 3. Radiation balance of ionosphere.—Author's abstract.*

1948

6E-54

551.510.535

Al'pert, I. A. L., **Sovremennoe sostoianie voprosa ob issledovaniiakh ionosfery.** [Present status of ionospheric research.] *Uspekhi Fizicheskikh Nauk*, Moscow, 36(1):1–29, Sept. 1948. figs., 6 tables, 51 refs., 6 eqs. **DLC**—A long review of theoretical basis for our present (1948) knowledge of the nature and formation of the ionosphere. A great deal of data and theory from recent literature from all parts of the world is organized along the following lines: 1) Formation of ionospheric layers; 2) Basic processes in ionosphere (photoionization, recombination of electrons, recombination of ions, dissociation of electrons from ions); 3) Theory of weaknesses; 4) Problems in the F2 layer and difficulties with the theory of photoabsorption of ultraviolet in F2 layer; 5) Effective impact index for various layers of the ionosphere; 6) Temperature, density and structure of the ionosphere. Models, tabular data and many references are given besides the theory. (*Same item as* 10-98, Oct. 1953, *MAB*.) *Subject Headings: 1. Ionospheric research 2. Ionospheric structure.—M.R.*

6E-55

551.510.41:546.17

Herzberg, G. and Herzberg, L., **Production of nitrogen atoms in the upper atmosphere.** *Nature*, London, 161 (4086):283, Feb. 21, 1948. 5 refs. **DLC**—Laboratory experiments are reported which lead to the belief that solar radiation around 1200Å will produce nitrogen atoms in the upper atmosphere by predissociation. It was formerly believed that only the extremely short ultraviolet beyond 500 Å could produce nitrogen atoms. *Subject Headings: 1. Atomic nitrogen in upper atmosphere 2. Nitrogen dissociation.—G.T.*

6E-56

551.521.4:551.594.51:535:33

†International Conference on the Emission Spectra of the Night Sky and Aurorae, London, 1947, **Papers.** London, Physical Society, 1948. 139 p. tables, graphs, bibliogs. [in French and English]. Price 20s. **DWB**—Problems connected with auroral and night-sky spectra are discussed by the foremost authorities in the field. The following papers contain substantial treatments of photochemical processes in the upper atmosphere: Bates, D. R., **Theoretical considerations regarding the night sky emission**, p. 21–33; Nicolet, M., **Deductions regarding the state of the high atmosphere**, p. 36–48; Bates, D. R. and Massey, H. S. W., **A note on the ionic composition of the upper atmosphere**, p. 48–50; Vegard, L., **Report on recent work on ionospheric phenomena and on solar and terrestrial relationships**, p. 82–91; Bates, D. R., Massey, H. S. W. and Pearse, R. W. B., **The aurora**, p. 97–105. (*Same item as* 4J-175, October 1953, *MAB*.) *Subject Headings: 1. Photochemistry of upper atmosphere 2. Night airglow spectrum 3. Ionosphere. I. Physical Society of London II. Royal Society of London, Gassiot Committee.—G.T.*

6E-57

551.521.4:551.594.5

†Khvostikov, I. A., **Svechenie nochnogo neba.** [Light of the night sky.] 2nd rev. ed. Moscow, Akademiia Nauk, 1948. 495 p. plates, diagrs., 434 refs., eqs. Price: 27 rub. **DLC**—Chapter includes a discussion of Chapman's photochemical theory, p. 413–416; dissociation effect of ultra-

violet solar radiation, p. 416-421 (including a table of effective wavelength and dissociation energy for O_3 and O_2); various photochemical theories of nightglow, p. 426-428; dissociation of nitrogen in the upper atmosphere, p. 452-456. (For fuller abstract see item 2.10-99, Oct. 1951, MAB) *Subject Headings:* 1. Night airglow 2. Photochemistry of upper atmosphere.—G.T.

6E-58

551.594.12:551.510.5

Massey, H. S. W.. Some problems of the upper atmosphere. *International Council of Scientific Unions, Brussels, Sixth Report of the Commission for the Study of Solar and Terrestrial Relationships*, p. 176-179, pub. Orléans, France, 1948. 14 refs., 2 eqs. DWB—Brief review of theories of formation of ionized layers, rates of ionization and recombination, nightglow and aurora. Reaction indicated in particular are those of dissociative recombination and of nightglow oxygen excitation (according to CHAPMAN) by atomic recombination. (Same item as 2.8-168, Aug. 1951, MAB) *Subject Headings:* 1. Ionization processes 2. Recombination processes 3. Upper atmosphere.—G.T.

6E-59

551.594.51:537.52:546.1

Mitra, Sisir Kumar, Active nitrogen—a new theory. Calcutta, Indian Association for the Cultivation of Science, 1945. 73 p. 19 figs., refs., eqs. Discussion, Kaplan, Joseph, Active nitrogen. *Physical Review*, 73(5):494-496, March 1, 1948. 2 figs., 3 refs., 2 eqs. Reply by Mitra (same title) *Ibid.*, 74(11):1637-1639, Dec. 1, 1948. 5 refs., eqs. DLC—A theory is proposed for the Lewis-Rayleigh afterglow of nitrogen. Although the excitation mechanism is mainly introduced in connection with discharge tubes, it is applicable to the auroral afterglow. The basic reaction involved in the theory is the three-body collision $N_2^+(X') + e + N_2 = N_2$ (B-state) + N_2 (A-state). J. KAPLAN believes that the presence of ions in the $N_2^+(X')$ in the auroral afterglow is evident against the mechanism proposed by author. KAPLAN suggests that the basic reactions in nitrogen afterglow, and probably auroras, are the dissociative recombination $N_2^+ + e = N' + N''$ and collision of the second kind involving very slow electrons and metastable atoms. In his reply MITRA reasserts the validity of his own theory. *Subject Headings:* 1. Auroral afterglows 2. Nitrogen afterglow.—G.T.

6E-60

551.594.12 551.510.535:541.1

Nicolet, M., L'absorption de la radiation solaire dans la haute atmosphère. [The absorption of solar radiation in the upper atmosphere.] *International Council of Scientific Unions, Brussels, Sixth Report of the Commission for the Study of Solar and Terrestrial Relationships*, p. 127-143, pub. Orléans, France, 1948. 3 tables, 47 refs. MH-BH—Discusses monochromatic absorption by sodium, oxygen, atomic nitrogen, photo-dissociation of ozone, photo-ionization. A table of coefficients of absorption of numerous gases at different wave lengths and resulting molecular change is given with a table of approximate levels of absorption. (Same item as 2.7-94, July 1951, MAB) *Subject Headings:* 1. Ionospheric ionization 2. Photochemistry of upper atmosphere 3. Upper atmosphere 4. Solar radiation.—C.E.P.B.

1949

6E-61

551.510.535:541.1

†Bates, D. R., The earth's upper atmosphere. *Royal Astronomical Society, London, Monthly Notices*, 109(2):215-245, 1949. 7 tables, bibliog. (137 refs.) p. 242-245, 40 eqs. DLC—A condensed review of the voluminous literature on the photochemistry of the ionosphere giving the essential reactions theoretically responsible for temperature, spectral and radio propagation anomalies in the higher atmosphere. Oxygen, nitrogen and sodium are the chief constituents of the atmosphere considered. An excellent bibliography is included. *Subject Headings:* 1. Photochemistry of upper atmosphere 2. Progress in ionosphere research.—M.R.

6E-62

551.510.53:

Kellog, William W., The atmosphere above 100 kilometers. 117 p. 21 figs., 13 tables 67 refs., 62 eqs. Typescript. Thesis (Ph.D.)—Univ. of California at L. A., April, 1949. DWI—A thorough analytical study of electronic and ionic processes in the ionosphere. The chapter on electronic detachment and attachment (p. 37-43) include tables giving coefficients of various types of associative detachment, photo-detachment, radiative attachment and dielectric attachment. Electronic recombination, discussed on p. 43-51, includes a table of recombination coefficients as determined by various investigators. *Subject Headings:* 1. Upper atmosphere 2. Electronic processes 3. Recombination coefficient.—G.T.

6E-63

551.510.535:541.14

Nicolet, M., Le problème des régions ionosphériques. [The problem of ionospheric regions.] *Journal of Geophysical Research*, 54(4):373-381, Dec. 1949. 5 refs., eqs. English summary p. 373 MH-BH—The effect of radiations from different regions of the sun on dissociation of the components of the upper atmosphere and their rates of recombination at different heights above 85 km are discussed. The E layer lies in the maximum concentration of O. Processes discussed or summarized

1 diagram — photodissociation of O_2 , photo-ionization of N_2 and N , ionization of Na , H_2O and He . (Same item as 2.8–51, Aug. 1951, MAB.) Subject Headings: 1. Ionosphere 2. Photochemistry of upper atmosphere.—C.E.P.B.

6E-64

551.510.535

Nicolet, M. and Bossy, L., *Sur l'absorption des ondes courtes dans l'ionosphère*. [On the absorption of short waves in the ionosphere.] *Annales de Géophysique*, 5(4):275–292, Oct.–Dec. 1949. 4 figs., 2 tables, 19 refs., 55 eqs. MH-BH—A theoretical study of the structure of the ionosphere in the E and D layers, including the probable temperatures, absorption and ionization in such variable layers, and variation of absorption of high frequency waves with varying zenith distance of the sun. The amount of dissociation of O_2 in the two layers is calculated. (Same item as 8–33, Aug. 1950, MAB.) Subject Headings: 1. Ionospheric structure 2. Absorption 3. Oxygen dissociation.—M.R.

6E-65

551.510.535:546.21

Penndorf, Rudolf, *The vertical distribution of atomic oxygen in the upper atmosphere*. *Journal of Geophysical Research*, 54(1):7–38, March 1949. 10 figs., 8 tables, 29 refs., 24 eqs. DWB—The photo-chemical dissociation of oxygen in the upper atmosphere and the recombination of the atoms by collision is studied using various values of incoming radiation and rate of recombination covering their probable range. It is found that there is a transition layer of equilibrium with a mean height between 100 and 110 km and a thickness of about 10 km. Zenith distance of the sun makes little difference and the height and shape of the layer are nearly the same everywhere and by day and night. (Same item as 2.7–66, July, 1951, MAB.) Subject Headings: 1. Ionosphere 2. Atomic oxygen distribution 3. Oxygen dissociation.—C.E.P.B.

6E-66

551.590.21 551.510.535

Relations entre les phénomènes solaires et géophysiques. Colloque international tenu à Lyon en 1947. [Relations between solar and geophysical phenomena. (International Colloquium, Lyons, 1947.)] Paris, *Revue d'Optique*, 1949. 312 p. figs., tables, refs., eqs. DCI-T—Contains over 40 papers presented at an international symposium in Lyon, France (1947). The papers deal with solar physics, properties of the ionosphere, auroras, light of the night sky, zodiacal light, etc. Although none of the articles are primarily concerned with photochemical processes in the upper atmosphere, some of them include discussion of such processes; especially: Nicolet, M., *Rayonnement solaire et origine de l'ionosphère* [Solar radiation and origin of the ionosphere], p. 35–68; Massey, H. S. W., *Excitation and ionization processes in the upper atmosphere*, p. 69–78; Kastler, A., *Le rôle de l'ion négatif oxygène dans la haute atmosphère* [The role of negative oxygen ions in the upper atmosphere], p. 79–90; Mitra, S. K., *Some unsolved problems of the upper atmosphere*, p. 91–97; Dufay, J. and Gauzit, J., *La raie 5577 Å de l'oxygène au crépuscule*, [The 5577 Å line of oxygen at twilight], p. 245–248; Aynard, R. and Herman, L., *Phosphorescence de la vapeur de sodium dans une atmosphère de gaz rare* [Fluorescence of sodium vapor in an atmosphere of rare gas], p. 261–264. Subject Headings: 1. Symposia 2. Solar-terrestrial relationships 3. Upper atmosphere.—G.T.

6E-67

551.510.535:546.33

Rodionov, S. F. and Pavlova, E. N., *Ob izluchenii atmosfer'nogo natriia*. [Radiation of atmospheric sodium.] *Akademiia Nauk, SSSR, Doklady*, 67(2):251–254, 1949. 2 figs., 7 refs. DLC—Photoelectric measurements of twilight Na Intensity made on the Elbrus Expedition of 1948 at 2200 m showed that absorption (D) occurs below $Z_0 = 95^\circ$ and emission line above 95° . The Na atoms in the layer from 20–30 km up to 60 km originate from NaCl molecules under the influence of UV solar radiation ($\lambda < 2400\text{Å}$) according to the following reaction $NaCl + h\nu \rightarrow Na + Cl$. In the low angles Z_0 the D -absorption line is affected by the fluorescence of the Na atoms being extinguished due to second order collisions with nitrogen molecules according to the reaction



The amount of N_2 at 30–40 km is sufficient for reducing the "resonance" fluorescence of Na to nearly 0, so the D -absorption line is only possible at $Z_0 > 92^\circ$. Subject Headings: 1. Twilight spectra 2. Sodium chloride dissociation 3. Sodium in upper atmosphere 4. Sodium D line 5. Mt. Elbrus.—M.R.

6E-68

551.510.534:541.14

*Schröder, E., *Theorie der Entstehung, Zersetzung und Verteilung des atmosphärischen Ozons*. [Theory of the formation, dissociation and distribution of atmospheric ozone.] Germany. *Deutscher Wetterdienst in der US-Zone, Berichte*, No. 11:13–23, 1949. 14 figs., 9 tables, eqs. MH-BH—Photochemical processes of ozone formation and dissociation are analyzed. Tables of numerical values presented include absorption coefficients of ozone and oxygen, energy quanta absorbed by

oxygen and ozone, rates of ozone formation and dissociation and exchange of ozone by turbulence. Curves of height distribution of temperature, ozone concentration and photochemical activity are included. *Subject Headings:* 1. Ozone photochemistry 2. Ozone distribution 3. Photochemical equilibrium of ozone.—G.T.

1950

6E-69

551.510.41:551.5

†Bates, David R. and Nicolet, Marcel, **The photochemistry of atmospheric water vapor.** *Journal of Geophysical Research*, 55 (3):301-327, Sept. 1950. 2 figs., 5 tables, 70 refs., 86 eqs. **MH-BH**—The concentration of OH radicals is estimated to fall to 10^{-5} at tropopause. They are formed by dissociation of water vapor by sunlight. These and other hydrogen compounds are broken up at about 90 km. The hydrogen escapes to space; the oxygen remains and the amount added to the atmosphere during geological time is roughly equal to that at present. The reactions between H and O_3 are considered responsible for night sky light. (Same item as 2.4-46, April 1951, MAB.) *Subject Headings:* 1. Water vapor dissociation 2. Atmospheric composition 3. Night airglow 4. Photochemistry of upper atmosphere.—C.E.P.B.

6E-70

551.510.535:546.3

Bates, David R. and Nicolet, Marcel, **Theoretical considerations regarding the altitude of the layer responsible for the nocturnal emission of the sodium D-lines.** *Journal of Geophysical Research*, 55 (3):235-239, Sept. 1950. 2 tables, 10 refs., 6 eqs. **DWB**—The altitude of the layer responsible for the nocturnal emission of the D-lines is discussed theoretically. General arguments are used to show that if the luminosity originates directly from atmospheric sodium, its location must be far lower than is indicated by the recent observations of BARBIER and ROACH. Should these prove to be even approximately correct, some other source would apparently have to be invoked. *Subject Headings:* 1. Sodium D line emission.—Authors' abstract.

6E-71

551.510.535:535.21

Bates, David R. and Seaton, M. J., **Theoretical considerations regarding the formation of the ionized layers.** *Physical Society of London, Proceedings, Ser. B*, 63(362):129-140, 1950. refs 28 eqs. **DLC**—The detailed mechanisms involved in the formation of the E, F₁, F₂ and D layers by solar ultra-violet radiation are discussed. Use is made of the results of some recent calculations on the continuous absorption cross-section of atomic oxygen and nitrogen, and of the evidence on the ionic composition of the layers that is provided by the analysis of the emission spectrum of the upper atmosphere during twilight. The uncertainties existing at present are emphasized. *Subject Headings:* 1. Photoionization 2. Ionospheric layers 3. Twilight spectra.—Authors' abstract.

6E-72

551.510.534:541.14

†Craig, Richard A., **The observations and photochemistry of atmospheric ozone and their meteorological significance.** *Meteorological Monographs*, (American Meteorological Society) Boston, 1(2), Sept. 1950. 50 p. 18 figs., 4 tables, 119 refs., append. (with 36 tables and eqs.) **DWB**—The most comprehensive treatment in the English language of the problem of ozone in the free atmosphere. After a brief history of significant research there is a thorough discussion and analysis of observational data with respect to latitude, season, altitude, temperature, air mass and frontal conditions and year. Variations in solar altitude, solar constant, temperature, etc. on the ozone concentration and photochemistry of the ozone layer are treated next. Then the causes of daily, seasonal and annual variation are considered. Lastly, there is a thorough bibliography and appendix containing a large amount of data gathered in various parts of the world, and constant, derived therefrom. (Same item as 2.1-67, Jan. 1951, MAB.) *Subject Headings:* 1. Ozone 2. Ozone variations 3. Ozone photochemistry.—M.R.

6E-73

551.510.534(02)

†Fabry, Charles, **L'ozone atmosphérique.** [Atmospheric ozone.] Paris, Centre National de la Recherche Scientifique, 1950. 278 p. 75 diagrs., tables, 155 refs., eqs. **MH-BH**—The theory of formation, equilibrium and variations of atmospheric ozone are discussed in Ch. 8 (p. 243-266). After analyzing the various reactions involved in the formation and dissociation of ozone, the author concludes that theories accepting ultraviolet radiation as the sole ozone-forming agent are incomplete, and that the mechanism of ozone formation has not yet been fully identified. (For full abstract see item 3.8-71, Aug. 1952, MAB.) *Subject Headings:* 1. Ozone research 2. Textbooks 3. Ozone photochemistry.—G.T.

6E-74

551.510.535:551.594.12

Massey, H. S. W., **Negative ions.** 2d ed. Cambridge, Univ. Press, 1950. 136 p. 31 figs. bibliog. p. 130-133. **DLC**—Properties of negative atomic and molecular ions, modes of formation

of negative ions, and detachment of electrons are discussed on the basis of laboratory studies. The final chapter deals with negative ions in glow discharges, in the earth's upper atmosphere and in the atmospheres of the sun and stars. The section on the upper atmosphere (p. 107-122) has been largely re-written for this second edition, to include latest information. Origin and properties of ionized layers, negative ion and electron concentration, attachment, detachment and recombination, and the role of negative ions in the night-sky emission are discussed. (*Same item as 6D-44*, April 1955, MAB.) *Subject Headings: 1. Negative ions 2. Upper atmosphere.—G.T.*

6E-75

551.510.534:541.14

Miyake, Y. and Saruhashi, K., **A photochemical theory on the formation of the ozone layer in the atmosphere.** *Geophysical Magazine*, Tokyo, 21(2):99-107, March 1950. 6 figs., 7 refs., 3 eqs. **DLC**—The fundamental reactions of ozone formation and dissociation proposed by CHAPMAN, WULF-DEMING, NICOLET and MECKE are discussed. The authors base their own theory on MECKE's formulas. They derive an equation of ozone equilibrium and, by calculating the available effective light quanta, arrive at a height distribution for ozone and for ultraviolet light absorption by oxygen and by ozone. *Subject Headings: 1. Ozone photochemistry 2. Photochemical equilibrium of ozone.—G.T.*

6E-76

551.594.51:535.35

Miyaniishi, Michika, **On the mechanism of the emission of the auroral green light in the night sky.** *Physical Society of Japan, Journal*, 5(1):1-4, Jan./Feb. 1950. 2 tables, 27 refs., eqs. **DLC**—A theory is proposed to account for the well-known 5577 Å emission from the night sky by supposing that, at the level of emission, the concentration of neutral O atoms is diluted by a large excess of H atoms. Excitation is produced by collision with 2 H atoms, a mol of neutral H resulting. The excited O atom then undergoes the forbidden transition, $^1S_0 \rightarrow ^1D_2$, under the influence of the molecular field of the uncombined H mol, with emission of the green line at 5577 Å. *Subject Headings: 1. Green auroral line 2. Excitation mechanisms 3. Recombination.—Physics Abstracts, No. 4563, 1950.*

6E-77

551.510.535:546.21

Moses, H. E. and Wu, Ta-you, **The distribution of atomic molecular oxygen in the upper atmosphere.** *Physical Review*, 78(3):333, May 1, 1950. **DLC**—Summary of a paper presented at the American Physical Society meeting at New York, Feb. 2-4, 1950. Oxygen density and temperature around 100-125 km altitude is calculated assuming photochemical equilibrium. It is found that "dissociation of molecular oxygen is not complete until around 200 km and that maximum density of atomic oxygen (which occurs at about 100 km) is about 10^{11} /cc and is thus considerably less than that estimated by previous workers." *Subject Headings: 1. Oxygen dissociation 2. Oxygen photochemistry.—G.T.*

6E-78

551.510.535:546.21

Penndorf, Rudolf (*Geophys. Res. Directorate, Cambridge, Mass.*), **The distribution of atomic and molecular oxygen in the upper atmosphere.** *Physical Review*, N. Y., 2nd Ser., 77(4):561-562, Feb. 15, 1950. 2 figs., table, 3 refs., eqs. **DLC**—Calculations based on photochemical dissociation in the ionosphere according to formula: $O_2 + h\nu \rightarrow O + O$ ($\lambda < 2445$) and recombination in 3-body collision: $O + O + M \rightarrow O_2 + M$ ($M = N_2, O_2, O$), with relative yield of M as $[M] = 0.6[N_2] + [O_2] + 0.1[O]$ gives model of (1) height of atmospheric transition layer for "normal" case to 120 km (in comparison with models of CHAPMAN, WULF and DEMING, RAKSHIT and SCHRÖER) and (2) composition of atmosphere. Author indicates a sharp transition layer of 10 km thickness between 95 and 105 km height. This height is constant day and night as nighttime recombination does not affect vertical distribution of atomic oxygen.

Composition of the ionosphere and mean molecular weight

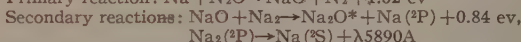
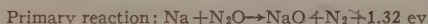
Height in km	Concentration in percent by volume			Mean molecular weight
	N ₂	O ₂	O	
110	69.4	0	30.6	24.33
105	69.9	0.4	29.7	24.45
100	76.9	10.9	12.2	26.97
95	81.2	16.2	2.6	28.34
90	81.6	17.3	1.1	28.56
85	82.0	18.0	0	28.73

Subject Headings: 1. Composition of stratosphere and ionosphere 2. Transition layer height 3. Oxygen photochemistry.—M.R.

6E-79

551.510.535:541.14

Penndorf, R., On the origin of the sodium D lines during twilight. *Physical Review*, 78(1):66, April 1, 1950. Comment [same title] by Kahn, F. D., *Ibid.*, 79(1):167, July 1, 1950. table 4 refs., 6 eqs. **DLC**—Experimental evidence is produced which appears to refute the current theory regarding the origin of the sodium flash during twilight. On the basis of laboratory studies the following photochemical reactions are proposed (assumed to take place near 100 km height):



KAHN in his critical note argues that the process proposed by PENNDORF would necessitate an "impossibly high" NaO concentration. *Subject Headings*: 1. Sodium D line 2. Photochemistry of upper atmosphere 3. Twilight. I. Kahn, F. D.—G.T.

6E-80

551.510.535:523.78

Savitt, Jacob, Recombination and attachment in the F-region during the eclipse of May 20, 1947. *Journal of Geophysical Research*, 55(4):385-394, Dec. 1950. 7 figs., table, 11 refs., 10 eqs. **MH-BH**—The variations of electron density at fixed real heights in the F2 region of the ionosphere during the solar eclipse of May 20, 1947, were compared with theoretical values expected under alternative assumptions that the electrons disappear either by recombination with positive ions or by attachment to neutral particles. The equations describing the recombination and attachment processes are developed and their application to the observational data is presented. The recombination and attachment coefficients, calculated by these equations, vary systematically with height and are of the same order of magnitude as those determined by other investigations. The best agreement between observed data and theoretical calculations is obtained at the 260 km level on the assumption that variations in electron density depend upon the attachment process. (Same item as 2.4-65, April 1951, MAB.) *Subject Headings*: 1. F layer 2. Electron density 3. Solar eclipses 4. Recombination processes 5. Electron attachment.—I.L.D.

6E-81

551.510.535

†Stranz, Dietrich, Die D-Schicht. [The D layer.] Germany. *Deutscher Wetterdienst in der US-Zone, Berichte*, No. 14, 1950. 31 p. 19 figs., 12 tables, 62 refs., 18 eqs. **MH-BH**—Dissociation and ionization processes involved in the formation of the D layer are discussed in detail with ample reference to previous research. Atmospheric penetration of UV radiation of various wave lengths is graphically illustrated and corresponding probable photochemical reactions are tabulated. (Same item as 10-56, Oct. 1950, MAB.) *Subject Headings*: 1. D layer 2. Dissociation 3. Ionospheric ionization 4. Photochemistry of upper atmosphere.—G.T.

1951

6E-82

551.510.535:550.381

†Bates, D. R. and Massey, H. S. W., The negative ion concentration in the lower atmosphere. *Journal of Atmospheric and Terrestrial Physics*, 2(1):1-13, 1951. fig., 3 tables, 31 refs., 23 eqs. **MH-BH**—Formation and destruction of negative ions in upper atmosphere and ratio λ of negative ions to electrons are examined. The main objection to the dynamo theory that quiet day magnetic variations arise from lunar and solar tides in conducting ionized layers across the earth's magnetic field is that it requires local tidal motion 6000 times that at ground level. Transverse ionic conductivity at 75 and 90 km is calculated on various assumptions. It is found that daytime negative ion concentration in D and E is quite inadequate to provide dynamo currents of sufficient magnitude. Fade-out enhancement of electron concentration in lower ionosphere is briefly discussed. (Same item as 3.11-102, Nov. 1952, MAB.) *Subject Headings*: 1. Ionospheric tides 2. Terrestrial magnetism.—C.E.P.B.

6E-83

551.510.4:541.14

Chapman, Sydney, Photochemical processes in the upper atmosphere and resultant composition. (In: *Compendium of Meteorology*, Boston, American Meteorological Society, 1951. p. 262-274. fig., 2 tables, 33 refs., 5 eqs.) **MH-BH**—The study of photochemical processes is most important for the development of our knowledge of the upper atmosphere, especially the ozone layer. The author gives a detailed outline of general principles of gas chemistry, in so far as they are important for meteorologists (energy levels, light absorption and emission, atomic and molecular spectra, excitation and de-excitation, dissociation and ionization, collisions, etc.). The absorption and emission, spectral evidence regarding upper atmospheric composition, the heights of the absorbing and emitting layers and the amounts of the absorbing and emitting constituents are examined and some facts about ozone, atomic oxygen and atmospheric sodium are summarized. (Same item as

4.8-5, Aug. 1953, *MAB.*) *Subject Headings:* 1. Upper atmosphere 2. Photochemistry of upper atmosphere 3. Atmospheric composition 4. Ozone 5. Compendium articles.—A.A.

6E-84 551.510.534:551.521.63

Craig, Richard A., Radiative temperature changes in the ozone layer. (In: *Compendium of meteorology*. Boston, American Meteorological Society, 1951. p. 292-302. 4 figs., table, 63 refs., 29 eqs.) MH-BH—A concise review of ozone distribution, temperature distribution in the ozone layer, ozone absorption, photochemistry of ozone and possible solar effects on ozone, owing to the large variability of UV radiation from the sun. The theory of heating and cooling of the ozone layer is examined and the results of calculations given. The main heating source is the ozone and oxygen absorption in the UV. Rocket flights gave new data on the solar spectrum in the important region 1800 to 3500Å. Atmospheric gases, responsible for cooling may be water vapor, carbon dioxide and ozone. (*Same item as 4.9-3, Sept. 1953, MAB.*) *Subject Headings:* 1. Ozone layer 2. Ultraviolet radiation 3. Ozonosphere heating 4. Compendium articles.—A.A.

6E-85 551.521.63:551.524.7:551.510.4

Gauzit, Junior, L'absorption du rayonnement solaire ultraviolet et la température de la haute atmosphère vers 100 km d'altitude. [Absorption of ultraviolet solar radiation and the temperature of the upper atmosphere at 100 km height.] *Académie des Sciences, Paris, Comptes Rendus*, 233(18): 1048-1049, Oct. 29, 1951. DWB—An investigation by R. PENNDORF (*see 6E-65*) of the formation of atoms of oxygen with high kinetic energy through photochemical dissociation of molecules serves as a basis for calculations undertaken by the author in order to determine the amount of average kinetic energy absorbed, at various levels of altitude, by oxygen atoms at the moment of their formation. As a result of these calculations, the author concludes that a temperature of 800°K between 90 and 95 km and 3800°K at about 130 km should develop unless it were for a considerable loss in heat through radiation, conductivity or convection. (*Same item as 3.10-155, Oct. 1952, MAB.*) *Subject Headings:* 1. Ultraviolet radiation 2. Atmospheric absorption 3. Upper air temperatures.—G.T.

6E-86 551.510.535:551.524.7

†Gerson, N. C., A critical survey of ionospheric temperatures. *Physical Society of London, Reports on Progress in Physics*, 14:316-365, 1951. 18 figs., 10 tables, 142 refs., 116 eqs. DLC—A survey of methods of inferring the temperature of the atmosphere using basic ionospheric equations. Probable mean annual temperatures in middle latitudes given by collisional frequencies; auroral scale heights and electron concentration are tabulated, showing an increase from 219-300°K at 100 km to a maximum of around 34,500°K at 400 km. It is tentatively considered that there are no large diurnal temperature variations. (*Same item as 3.4-100, April 1952, MAB.*) *Subject Headings:* 1. Upper air temperatures 2. Ionosphere.—C.E.P.B.

6E-87 551.510.534:541.14

†Götz, F. W. Paul, Ozone in the atmosphere. (In: *Compendium of Meteorology*, Boston, American Meteorological Society, 1951. p. 275-291. 16 figs., 3 tables, 104 refs., 31 eqs.) MH-BH—The photochemical theory of atmospheric ozone is reviewed on p. 281-283. (For fuller abstract, *see item 4.2-5, Feb. 1953, MAB.*) *Subject Headings:* 1. Photochemistry of upper atmosphere 2. Photochemistry of lower atmosphere 3. Ozone theory.—G.T.

6E-88 551.510.535:546.33

Hoffmeister, C., Spezifische Leuchtvorgänge im Bereich der mittleren Ionosphäre. [Specific luminous processes in the middle ionosphere.] *Ergebnisse der Exakten Naturwissenschaften*, 24:1-53, 1951. 28 figs., 22 tables, 115 refs. DLC—This thorough review of available knowledge and theories on nightglow contains a brief discussion of possible recombination mechanisms which would yield the necessary excitation energy (p. 35-37). Theories of the origin of atmospheric sodium are mentioned (p. 37-38). *Subject Headings:* 1. Recombination processes 2. Sodium origin.—G.T.

6E-89 551.593.9:535.35

Krasovskii, V. I. and Lukashenya, V. T., K voprosu ob otozhdestvlenii spektra nochnogo neba okolo 10,000Å. [Identification of the night sky spectrum around 10,000Å.] *Akademiia Nauk SSSR, Doklady*, 80(5):735-738, 1951. DLC—Discusses 2-3 spectrograms of the night sky spectrum near 10,000Å taken with a spectrograph having a dispersion of c.175 Å/mm and a resolving power down to 5Å, and showing many new details and blackening in all spectrum portions. The authors enlarge upon the theory of the excitation mechanism of the night-sky radiation, developed by KRASOVSKIĬ (1950, 1951). The initial excitation is due to a ternary collision resulting in the formation of the excited molecules of O', NO', N₂', O₂ and N₂O. *Subject Headings:* 1. Night airglow spectrum 2. Excitation mechanisms.—*Physics Abstracts*, No. 4812, 1952.

6E-90

551.593.9 551.510.535:541.14

Krasovskii, V. I., *Vliianie parov vody i okslov ugleroda i azota na svechenie nochnogo neba.* [Influence of water vapor and carbon monoxide and nitric oxide on the luminescence of the night sky.] *Akademiia Nauk SSSR, Doklady*, 78(4):669-672, 1951. 18 refs., 5 eqs. **DLC**—The important reactions considered are $\text{H}_2\text{O} + \text{O} \rightleftharpoons \text{OH} + \text{OH}$; $\text{H} + \text{CO} + \text{M} \rightarrow \text{HCO} + \text{M}$ (where M is any molecule or atom occurring in the atmosphere); $\text{HCO} + \text{HCO} \rightarrow \text{H}_2\text{CO} + \text{CO}$, by which WILD proved the occurrence of formaldehyde in the atmosphere of Venus, and to which a parallel was found in 1946 when the solar radiation was directly observed at altitudes >50 km and an absorption band 2850 Å was discovered near which the maximum absorption of aldehydes and ketones is located, organic compounds of which formaldehyde is the simplest. Furthermore, $\text{NO} + \text{O} \rightarrow \text{NO}_2 + \text{hv}$; $\text{NO}_2 + \text{O} \rightarrow \text{NO} + \text{O}_2$. Atomic oxygen in the 'D and 'S states has an excitation energy exceeding the activation energy of reaction (1). Thus H_2O must be regarded as the most active quencher of excited metastable states of atomic oxygen and the hydroxyl can therefore only be formed in the ground state of oscillation. The possible maximum excitation of OH corresponds to the second oscillation level in the case O('D) and to the 9th of O('S). Water vapor dissociates into OH and H only under radiation $\lambda < 1400\text{Å}$. Such a process is only possible in the ionosphere. Reaction (1) proves that H_2O vapor may dissociate into OH wherever there are excited metastable O-atoms. In a sustained reaction between OH and O or N atomic H may appear independently of the presence of radiation $< 1400\text{Å}$. The quenching effect of H_2O vapor on excited atomic O which reduces the intensity of the known emission of the night sky near 6300 and 5577 Å may be used as a criterion of the moisture content of high layers of the atmosphere. The 5577 Å radiation emitted at the lowest level may be totally quenched in the zone of active formation of the silver clouds. This opens a way for using luminescence of the night sky as a new means of meteorological investigation and prediction. *Subject Headings: 1. Night airglow spectrum 2. Photochemistry of upper atmosphere.—Physics Abstracts, No. 9852, 1951.*

6E-91

551.594.51 551.521.4

Meinel, A. B., *The spectrum of the airglow and the aurora.* *Physical Society of London, Reports on Progress in Physics*, 14:121-146, 1951. 5 figs., 8 tables, 60 refs. **DLC**—Begins with an account of the spectrum of the night sky from 3000-14,000 Å, consisting of bands due to various gases and a continuous background of uncertain origin. It is attributed to region below 120 km. The characteristic spectrum of the twilight glow is briefly described, and the spectrum of the aurora is discussed and illustrated in detail. The atomic and molecular processes involved are discussed. Temperature estimates from the aurora diverge widely. (Same item as 3.3-258, March 1952, M.A.B.) *Subject Headings: 1. Night airglow 2. Auroral spectra 3. Recombination processes.—C.E.P.B.*

6E-92

551.594.5:546.17

Mitra, S. K., *Atomic nitrogen in auroras.* *Nature*, London, 167(4257):897, June 2, 1951. 10 refs., 2 eqs. **DLC**—Suggests two processes for the dissociation of nitrogen molecules or for the excitation of nitrogen atoms: 1) $\text{N}_2^+(\text{X}') + \text{e} \rightarrow \text{N}(\text{'P}) + \text{N}(\text{'D})$, involving dissociative recombination of $\text{N}_2^+(\text{X}')$ ions, or 2) $\text{N}_2^+(\text{X}') + \text{O} \rightarrow \text{N}_2(\text{B}) + \text{O}(\text{'S})$, neutralization of N_2^+ ions by electron transfer in the presence of negative ions of O. (Same item as 5C-185, March 1954, M.A.B.) *Subject Headings: 1. Nitrogen dissociation 2. Auroral physics.—M.L.R.*

6E-93

551.510.41:546.21

Moses, H. E. (Columbia Univ.) and Wu, Ta-you (Ottawa), *A self-consistent treatment of the oxygen dissociation region in the upper atmosphere.* *Physical Review*, New York, 83(1):109-121, July 1, 1951. 5 figs., refs., 32 eqs. **DLC**—Theory is developed for determining degree of dissociation and recombination of molecular or atomic oxygen, and the temperature at 100-140 km. Calculations are made in detail and results presented graphically. Pressure from 100 to 140 km is shown graphically for various types of soundings (rocket and radio wave). Appendices show various derivations such as the equations for steady state in the detailed model, time required to reach dissociative steady state, the radiative recombination coefficient, cross sections for three-body recombination collisions, discussions of the work of PENNDORF and RAKSHIT, etc. (Same item as 3.11-93, Nov. 1952, M.A.B.) *Subject Headings: 1. Oxygen dissociation 2. Ozonosphere 3. Upper air computation 4. Radiative recombinations. I. Penndorf, R. II. Rakshit, H.—M.R.*

6E-94

551.510.535 551.594.7:621.396

Nicolet, Marcel, *Effects of the atmospheric scale height gradient on the variation of ionization and short wave absorption.* *Journal of Atmospheric and Terrestrial Physics*, 1(3):141-146, 1951. 2 tables, 3 refs., 35 eqs. **MH-BH**—The local "scale height" H for an active constituent of the atmosphere depends on its concentration and absorption coefficient and the solar zenith distance. Author calculates effect of variation of H on certain theoretical characteristics of the ionosphere,

including variation of critical frequency with height of sun, short wave absorption, absorption of solar radiation and electronic recombination. (*Same item as 2.9-67, Sept. 1951, MAB.*) *Subject Headings: 1. Ionosphere 2. Microwave absorption.—C.E.P.B.*

6E-95

551.521.4

†Nicolet, M., *Problèmes de l'émission spectrale du ciel nocturne et des aurores*. [Problems of the spectral emission of the night sky and of auroras.] *International Council of Scientific Unions, Brussels, Seventh Report of the Commission for the Study of Solar and Terrestrial Relationships*, p. 165-182, pub. Paris, 1951. table, 38 refs. DWB—Three symposia in 1947 initiated important progress. Known radiations from the night sky are tabulated but altitudes and temperatures of the emitting layers are mostly uncertain. From night sky and auroral radiations some conclusions are drawn about vertical changes of composition of the atmosphere. Chemical and physical processes are discussed. Twilight observations are based on dissociation of N_2 at very high levels. (*Same item as 3.7-121, July 1952, MAB.*) *Subject Headings: 1. Night airglow spectrum 2. Auroral spectra.—C.E.P.B.*

6E-96

551.510.535:523.7

†Piddington, J. H., *The modes of formation of the ionospheric layers*. *Journal of Geophysical Research*, 56(3):409-429, Sept. 1951. 2 figs., 2 tables, 52 refs., 8 eqs. MH-BH—Data obtained during eclipses (1932-1947) by various authors lead to the following conclusions regarding the formation and structure of the ionosphere: 1) the rates of electron disappearance seem to be much higher and consequently the number of ionizing quanta higher than previously estimated. However the F2 region may be much thicker than supposed so the maximum remains unchanged, or tidal effects may complicate the picture by causing large vertical movements of ions; 2) residual effects during eclipses indicate that there is probably nonsolar source of electron production, such as electric currents flowing in the E and maybe the D region. Confirmation exists in correlation with magnetic and auroral effects; 3) ionizing emissions do not come from entire corona but from the lower chromosphere or in transition regions which may exist at the base of the corona. Also near sunspots or disturbances of the chromosphere there are regions of excessive emission; 4) the emission spectrum shows the following features; H Lyman spectrum (13.5 eV), He(I) spectrum at 24.6 eV, He(II) spectrum at 54 eV, line and continuous emission from atomic O, N, Ne, C up to several hundred eV, also X-rays ranging down to 3 Å or to <1 Å during solar flares and 5) the F1 and F2 layers can be accounted for by the above features. The D layer can be accounted by two agencies such as X-rays and electric currents of a few thousand electron volts and the E layer by emission of a few hundred electron volts from the chromospheric transition region. (*Same item as 4.6-85, June 1953, MAB.*) *Subject Headings: 1. Ionosphere formation 2. Solar physics 3. Ionospheric layers.—M.R.*

6E-97

550.510.41:535.33(02)

Prokof'eva, I. A., *Atmosfernyi ozon*. [Atmospheric ozone.] Moscow, Akademiia Nauk, 1951. 231 p. graphs, charts, diagrs., tables, 213 refs. Price: 11.50 rub. DLC—The chapter on the interpretation of experimental data (p. 166-219) includes a detailed discussion of the atmospheric ozone theory featuring, among others, a table of possible chemical reactions in the atmosphere (involving oxygen) under the direct or indirect influence of radiation. (*Same item as 3.4-9, April 1952, MAB.*) *Subject Heading: 1. Ozone distribution.—G.T.*

6E-98

551.510.535

Rawer, Karl and Argence, Émile, *Sur quelques caractéristiques de la région E de l'ionosphère*. [Some characteristics of the E region of the ionosphere.] *Académie des Sciences, Paris, Comptes Rendus*, 233(20):1208-1210, 1951. 5 refs., eq. DWB—A determination of the characteristic constants of the E region and calculation of the values of the effective layer and of the number of quanta corresponding to the observed ionization. Also a comparison of the quantitative results of PENNDORF obtained for the dissociation of O_2 and the hypothesis that the E layer is formed by the photoionization of this molecule. Conclusion is that O_2 dissociation occurs at a higher altitude than proposed by PENNDORF because the ionization processes cannot be attributed to O_2 dissociation but to X-ray action. (*Same item as 4.6-86, June 1953, MAB.*) *Subject Headings: 1. Ionospheric composition 2. E layer 3. Oxygen dissociation 4. Ionospheric ionization.—Authors' abstract.*

6E-99

551.510.4:546.33:551.510.535

Saha, Arun Kumar, *Sodium in the upper atmosphere*. *Indian Journal of Physics*, 25(8):375-386, Aug. 1951. table, 23 refs., 4 eqs. DLC—The paper first surveys the available data for the sodium phenomena in the upper atmosphere, namely, intensity variations of the D lines in the night airglow and in the twilight flash, the height of the emitting layers, the distribution of sodium in the atmosphere and its probable source. The various excitation processes, both regarding the twilight flash and the night airglow emission are closely examined. It is shown that the most probable

mode of production of the twilight flash is resonance excitation of neutral sodium atoms in 35–65 km region by solar radiation λ 5893, there being no significant effect of zone screening. The possible excitation processes in the night airglow are examined critically on the assumption that the height of the emitting layer is 250 km (as obtained by BARBIER and ROACH) and that above 100 km sodium exists wholly in the ionized state (as shown by BATES). Two possible excitation processes are examined: 1) radiative recombination of Na^+ ions and 2) mutual neutralization of Na^+ and O^- ions. Of these two processes the latter seems more probable as the former requires impossibly high concentration of Na^+ ions. But the latter process cannot maintain the observed intensity of the radiation throughout the dark hours of the night. Hence, it is concluded that extra-terrestrial particles must be bombarding the upper atmospheric regions, ionizing and/or exciting the neutralized Na^+ ions. Alternatively, it may be assumed that sodium atoms are entering the atmosphere from the interplanetary space. (Same item as 4.10–11, Oct. 1953, MAB.) Subject Headings: 1. Sodium spectra 2. Atmospheric composition 3. Night airglow.—Author's abstract.

6E-100

551.521.4:546.33

Tanaka, Yoshio (Tokyo Univ. Inst. for Optical Res.) and Ogawa, Masaru, On the origin of sodium D lines in the night sky emission and twilight flash (I). Tokyo. Univ. of Education, Institute for Optical Research, *Science of Light*, 1(2):61–64, Oct. 1951. diags., refs. In Japanese; English summary, append. p. 6. DWB—Laboratory experiments undertaken at the Institute for Optical Research are reported. Purpose of the experiments was to determine the series of chemical reactions producing the D line luminescence of sodium which can be observed in the night sky spectrum. The apparatus used in the experiments is described and represented in schematic diagrams. As a result of the investigation two tentative chemical processes are offered for the cases $\text{D}(\text{NaO}) < 3.9\text{eV}$ and $\text{D}(\text{NaO}) \approx 4.0\text{eV}$, respectively. It is pointed out that these processes do not agree with the one suggested by CHAPMAN. Subject Headings: 1. Sodium D line 2. Night airglow spectrum.—G.T.

1952

6E-101

551.510.535:541.14

†Bates, David R., Ionization and recombination processes in the upper atmosphere. U. S. Air Force, Cambridge Research Center, *Geophysical Research Papers*, No. 11:225–234, 1952. 21 refs., 29 eqs. DWB—A concise review of information available on the main ionic processes taking place in the upper atmosphere. An attractive feature of this paper is a table showing 15 different reactions (ionization, pre-ionization, detachment, recombination, attachment, etc.) and their cross sections or rate coefficients. Reference to basic literature on the reactions reviewed is included. (Same item as 4.11–97, Nov. 1953, MAB.) Subject Headings: 1. Ionization processes 2. Recombination processes 3. Photochemistry of upper atmosphere.—G.T.

6E-102

551.510.535

Bates, D. R. and Massey, H. S. W., On negative ions of molecular oxygen in the D-layer. *Journal of Atmospheric and Terrestrial Physics*, 2(4):253–254, 1952. 6 refs. MH-BH, DWB—Referring to recent (1951) measurements by M. A. BIONDI of rate of attachment of slow electrons to O_2 , authors calculate day negative ion to electron ratio, obtaining mean and extreme values of 0.5 and 50 at 75 km and 0.05 and 5 at 90 km. (Same item as 3.11–101, Nov. 1952, MAB.) Subject Headings: 1. Ionospheric research 2. D layer.—C.E.P.B.

6E-103

551.510.41:541.14

†Bates, David R. and Witherspoon, A. E., The photo-chemistry of some minor constituents of the earth's atmosphere (CO_2 , CO, CH_2 , N_2O). Royal Astronomical Society, *Monthly Notices*, 112(1):101–124, 1952. 2 figs., 2 tables, 83 refs., 61 eqs. DWB—Photodissociation of CO_2 is appreciable only above 100 km, where carbon occurs mainly as CO, but CO extends below this level. Combustion on earth would provide the CO content of the atmosphere in 4 years or less. Collision processes prevent appreciable CH_2 above 100 km and concentration is rare down to 70 km. At least 10 years and probably much longer would be required for natural production at earth's surface of existing amount. The origin of N_2O is discussed; known possible reactions are very slow but may be sufficient. Diagrams show concentration of O, O_2 and O_3 up to 120 km height. An appendix discusses concentration of metastable nitrogen molecules at high levels. (Same item as 5.2–78, Feb. 1953, MAB.) Subject Headings: 1. Atmospheric composition 2. Carbon dioxide 3. Ozone 4. Photochemistry of upper atmosphere 5. Photochemistry of lower atmosphere.—C.E.P.B.

6E-104

551.510.41:541.14:551.510.53

†Bates, D. R. (Queen's Univ., Belfast), Some reactions occurring in the earth's upper atmosphere. *Annales de Géophysique*, 8(2):194–204, April/June 1952. table, 32 refs., eqs. French and English

summaries p. 194. **DWB**—The photochemical reactions determining the equilibrium between N_2 , N , NO and NO_2 are examined and some general deductions are made. The atomic oxygen in the upper atmosphere acts as a catalyst assisting the reformation of molecular nitrogen. The origin of N_2O in the atmosphere is discussed. It is tentatively suggested that the gas may be formed in the tropopause by collision processes between O or O_3 , and N_2 . A recent suggestion that N_2O is indirectly responsible for excitation of the Meinel hydroxyl bands is investigated. The conclusion reached is that the suggestion is unacceptable. (*Same item as 4.9-66, Sept. 1953, MAB.*) *Subject Headings: 1. Atmospheric composition 2. Photochemistry of upper atmosphere.*—*From author's abstract.*

6E-105

551.510.535:546.21:539

Choudhury, D. C., **Production of the E layer in the oxygen dissociation region in the upper atmosphere.** *Physical Review*, 88(2):405-408, Oct. 15, 1952. fig., table, 12 refs., eq. **DLC**—Starting with the generally accepted theory that the E layer is formed by ionization of O_2 in the region of its dissociation, the probable value of the absorption cross-section of O_2 for this ionization is calculated by utilizing the height distribution of O_2 (in transition region) as recently obtained by MOSES and WU. It is found that, depending upon the temperature gradient and the boundary temperature chosen for the region of dissociation, the necessary absorption cross section varies from 3×10 cm to 9×10 cm. Hence, it follows that for the two current hypotheses of E layer ionization, namely, pre-ionization by solar rays in the wavelength range 900-1000 (NICOLET) and ionization by high-energy photons emitted from the solar corona (HOYLE and BATES), the ionization cross-section of O should also lie within this range. For the former, the rate of ion production (as obtained by application of simple Chapman formula and assuming the sun to be radiating like a blackbody) appears to be one hundred times more than the observed rate. The discrepancy is removed if it is assumed that of the molecules excited to the pre-ionization levels by absorption, only a small fraction (one in a hundred) undergoes ionization. For the high-energy photons it is found that in order to have the necessary absorption cross-section, the energy should be 181 eV rather than 325 eV as obtained by HOYLE and BATES. It is suggested that both the pre-ionization process and the ionization by high-energy photons are operative in producing E layer ionization. The former produces the normal E layer and the latter (of different frequencies) intensifies the ionization at different levels producing the fine structure of the E layer as reported recently. *Subject Headings: 1. E layer 2. Ionospheric ionization 3. Oxygen dissociation.* *Physics Abstracts, No. 563, 1953.*

6E-106

551.510.535:551.521.63

Clark, K. C., **Ionospheric absorption by N_2 and O_2 of certain extreme ultraviolet solar wavelength.** *Physical Review*, New York, 87(2):271-276, July 15, 1952. 3 figs., table, 37 refs., 17 eqs. **DLC**—Measurements are reported of the coefficients of absorption by the gases N_2 and O_2 of the emission of the H Lyman series, 2-7, the resonance line $584\text{\AA}$ of He(I), and twenty lines of H β between $980\text{\AA}$ and $850\text{\AA}$, the atomic lines likely being strong in solar radiation. For an atmosphere of constant relative composition the absorption coefficients are related to the atmospheric height of maximum photoionization and maximum electron concentration by equations which allow for a constant temperature gradient, the inverse square decrease of gravity and a recombination process which may vary with height. With these laboratory measurements for N_2 and O_2 and the known calculated absorption for O , ionosphere layer heights are computed for the simple case which assumes complete O_2 dissociation above 100 km, no N_2 dissociation, and two-body recombination. Although only the first assumption is probably secure, it appears that photoionization is capable of producing layers at heights which agree with observation. (*Same item as 4.5-87, May 1953, MAB.*) *Subject Headings: 1. Ultraviolet radiation 2. Ionosphere 3. Atmospheric absorption.*—*Author's abstract.*

6E-107

551.510.535:541.14:551.521.63

Gauzit, Junior (*Lyon Observatory*), **Relations entre la température et les phénomènes de dissociation ou d'ionisation photochimique dans la haute atmosphère. Examen particulier de la région E.** [Relation between temperature and photochemical dissociation or ionization in the upper atmosphere with special consideration of the E layer.] *Annales de Géophysique*, 8(2):226-231, April/June 1952. 5 refs. French and English summaries p. 226. **DWB**—The initial kinetic energy of oxygen atoms created by photodissociation of oxygen molecules through absorption of radiation between 1750 and $1200\text{\AA}$ has been calculated for altitudes between 100 and 130 km and found to be equivalent to 3200 to 3600°K . Values used in the calculation were taken from PENNDORF's atmospheric model. *Subject Headings: 1. E layer 2. Photochemistry of upper atmosphere 3. Ultraviolet radiation.*—*G.T.*

6E-108

551.510

*Gerson, Nathaniel C., **The terrestrial atmosphere.** *Science Progress*, London, 40(158):245-254, April 1952. fig., 7 tables. **DWB**—The atmosphere is divided into troposphere, stratosphere,

chemosphere, ionosphere, mesosphere and exosphere by surfaces (in lat. 45°) at 11, 32, 80 and 400 km. Text and tables summarize composition and photochemistry, temperature, pressure, density and free path at different levels, height and electron density of ionic layers D-G. Brief accounts are given by aurora, night and twilight airglow, and dynamics of ionosphere and mesosphere. (*Same item as 3.7-77, July 1952, MAB.*) *Subject Headings:* 1. Night airglow 2. Atmospheric structure 3. Auroras 4. Ionosphere.—C.E.P.B.

6E-109

551.510.53

†Gerson, Nathaniel C. (U. S. A. F., Cambridge Res. Center), **Unsolved problems in physics of the high atmosphere.** *Advances in Geophysics*, New York, 1:155-242, 1952. 12 figs., 10 tables, 177 refs. **DLC**—The various subdivisions of the atmosphere (troposphere, stratosphere, chemosphere, ionosphere, mesosphere and exosphere) are defined and discussed. Chemical composition of the atmosphere is discussed and given in tables of the normal chemical constituents, the isotopes, ionization and dissociation potentials of molecules, and probable constituents of ionosphere and chemosphere, and origin thereof. Also tabulated are temperature, pressure, number density, mean free path and kinematic viscosity at latitudes from 0-800 km in mid-latitudes and two seasons. The ionosphere, emissions (airglow and aurora) and spectra thereof, new techniques for estimating ionospheric wind from cloud (noctilucent, luminous, airglow and sporadic E clouds) movements. States properties and processes such as temperature and its determination by various means, composition as determined from emission spectra and absorption spectra, photochemical equilibrium, collisional phenomena, ionospheric tides and other oscillations, diffusion in magnetic and electric fields and, finally, a summary of unsolved problems which are being or should be worked on. A very extensive bibliography (177 items) on all aspects of high atmospheric physics is appended. (*Same item as 4.8 10, Aug. 1953, MAB.*) *Subject Headings:* 1. Upper atmosphere research 2. Atmospheric structure 3. Atmospheric composition 4. Review articles 5. Advances in geophysics.—M.R.

6E-110

551.510.535:537.53

Huxley, L. G. H. (Adelaide Univ., Adelaide, Australia), **The motion of slow electrons in gases in relation to ionospheric studies.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11:86-110, 1952. 10 refs., 56 eqs. **DWB**—The facts relating to motions of electrons in gases are first discussed, followed by presentation of formulas for drift in a steady and uniform electric field, conductivity in an alternating field, drift velocities in an applied magnetic field, and in combined alternating electric field and applied magnetic field. Then the absorption coefficient of an electromagnetic wave and the coefficients of diffusion are presented; ionospheric convection currents are treated as well as laboratory experiments on the mean proportion η of energy lost per collision by an electron and experimental checks of theoretical formulas for drift and conductivity. *Subject Headings:* 1. Electronic motion in gases 2. Slow electrons 3. Ionosphere.—M.R.

6E-111

551.510.534

Johnson, Francis S.; Purcell, J. D.; Tousey, R. and Watanabe, K., **Direct measurements of the vertical distribution of atmospheric ozone to 70 kilometers altitude.** *Journal of Geophysical Research*, 57(2):157-176, June 1952. 10 figs., 5 tables, 21 refs., 19 eqs. **MH-BH**—Atmospheric ozone was measured to an altitude of 70 km over the White Sands Proving Grounds, New Mexico, on June 14, 1949. The data were obtained from a series of solar ultraviolet spectra photographs near sunset from two spectrographs installed in an Aerobee rocket. The ozone concentration above 35 km decreased approximately exponentially and was in good agreement with the concentration calculated from photochemical theory, provided that the three-body collision process $O + O + M \rightarrow O_2 + M$ was considered. (*Same item as 4.3-97, March 1953, MAB.*) *Subject Headings:* 1. Ozone distribution 2. Ozone measurement techniques 3. White Sands Proving Grounds, New Mexico.—Authors' abstract.

6E-112

551.510.41:551.593.55

Kaplan, Joseph (U.C.L.A., Los Angeles), **The chemosphere.** (In: U. S. School of Aviation of Medicine, Randolph Field, Texas, **Physics and medicine of the upper atmosphere.** Albuquerque, 1952. p. 99-108. 2 tables, 5 refs.) **DLC**—The term chemosphere represents the existence and importance of chemical reactions in the atmosphere. The author discusses the history of the discovery of atmospheric ozone and its function, the photochemistry of oxygen and of oxygen-hydrogen atmospheres, the chemical role of nitrogen and of its compounds, the visible afterglow in nitrogen of the Lord Rayleigh afterglow which is produced by the energy released by the combination of metastable N_2 atoms, the molecular oxygen afterglow and the night afterglow produced by the OH molecule. (*Same item as 4.6-73, June 1953, MAB.*) *Subject Headings:* 1. Chemosphere 2. Chemical composition of upper atmosphere 3. Nitrogen afterglow 4. Photochemistry of upper atmosphere.—I.L.D.

6E-113

551.510.53

Kaplan, J., Discussion of physics of the upper atmosphere. (In: U. S. School of Aviation Medicine, Randolph Field, Texas, **Physics and medicine of the upper atmosphere**. Albuquerque, 1952. p. 331-351.) **DLC**—Includes a discussion of the formation of N_2O in the upper atmosphere (above 35 km), by M. NICOLET. The mechanism proposed is the three-body collision $N_2 + O + M \rightarrow N_2O + M$, the necessary O atoms being supplied by $O_3 + h\nu \rightarrow O_2 + O$. (For fuller abstract see item 4.11-89, Nov. 1953, *MAB*.) *Subject Heading*: 1. Upper atmosphere physics.—G.T.

6E-114

551.521.61

Krasovskii, V. I., *Issledovanie infrakrasnogo izlucheniia neba*. [Investigation of the infrared radiation of the night sky.] *Uspekhi Fizicheskikh Nauk*, Moscow, 47(4):493-514, Aug. 1952. 7 figs., 24 refs. **DLC**—A review on recent advances, based on 16 Russian and 8 foreign papers, including recent sources of MEINEL and KAPLAN. Near infrared region covered up to 12,000Å. Spectrographic equipment developed with a dispersion up to 150Å, resolution up to 5Å, exposure of few hours. Maximum of intensity during midnight and winter. It was not possible to find radiation of atomic oxygen and nitrogen, nor of molecular nitrogen. Radiation of molecular oxygen definitely found, Hydroxyl bands also behind 10,000Å. Author gives theoretical explanation of processes involved, assuming that nocturnal radiation is caused by the dissociation energy of molecules, but reviews also other points of view (ozone-hydrogen hypothesis). (Same item as 4.8-12, Aug. 1953, *MAB*.) *Subject Headings*: 1. Infrared radiation 2. Nocturnal radiation.—A.A.

6E-115

551.594.12:551.521.63:551.510.535

Lindquist, Rune (*Ionospheric Res. Lab., Penna. State College*), **An investigation of the ionizing effect in the E layer near sunrise**. *Journal of Geophysical Research*, 57(4):439-458, Dec. 1952. 9 figs., 31 eqs. **MH-BH**. Also issued as: Pennsylvania. State College. Ionospheric Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 34, March 20, 1952. 59 p. 18 figs., 41 tables, 20 refs., 38 eqs. **DWB**—This paper discusses the pre-sunrise decrease in height of the reflection point noted in 150 kc/sec vertical incidence group height recordings. It is shown that the local time of this decrease has a pronounced seasonal variation. The total number of particles along the sun ray to the reflection point where the height decrease begins has been computed. This number is almost constant throughout the year, yielding a value of about 3.3×10^{20} atmospheric particles. By considering the composition of the upper atmosphere, it is shown that the only constituent which might possibly be subject to the pre-sunrise ionization is O_2 . The corresponding solar radiation should have $\lambda > 910\text{Å}$. The value for the absorption coefficient of O_2 obtained from these considerations is $K_{O_2} = (3.3 \pm 2.1) \times 10^{-19} \text{ cm}^2$. It is shown that the pre-sunrise ionization is not due to a pure screening effect. (Same item as 4.9-255, Sept. 1953, *MAB*.) *Subject Headings*: 1. Ionospheric ionization 2. E layer.—Author's abstract.

6E-116

551.510.535:537.568(02)

Massey, H. S. W. and Burhop, E. H. S., **Electronic and ionic impact phenomena**. Oxford, Clarendon Press, 1952. 669 p. 286 figs., tables, eqs., refs. **DLC**—This comprehensive text on ionic and electronic phenomena under laboratory conditions includes a section on recombination in the earth's ionosphere (p. 641-646). Properties of ionospheric layers, and recombination, attachment and photo-detachment processes and coefficients are discussed. *Subject Headings*: 1. Recombination processes 2. Textbooks.—G.T.

6E-117

551.510.535:537

Massey, H. S. W., **Recombination of gaseous ions**. *Advances in Physics*, London, 1(4):395-426, Oct. 1952. 8 figs., 2 tables, 59 refs., 39 eqs. **DLC**—The paper summarizes present knowledge of recombination at low, e.g., ionospheric pressures. Possible processes of recombination of electrons with ions are discussed, greatest importance being attached to dissociative recombination. Methods of experimental investigation are described with emphasis on the microwave method of change of frequency of a resonant cavity containing a vessel in which the discharge can be alternately initiated and cut off. Recombination between + and - ions is briefly reviewed. Daytime formation and recombination of electrons in the ionospheric layers are discussed and a reference made to radiative recombination in the solar corona. (Same item as 4.9-72, Sept. 1953, *MAB*.) *Subject Headings*: 1. Ionosphere 2. Recombination processes.—C.E.P.B.

6E-118

551.510.535:551.590.25:551.594.12

†Millman, Peter M. (*Dominion Observatory, Ottawa, Canada*), **Meteorite ionization [and discussion]**. *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11:204-224, 1952. figs., 44 refs. **DWB**—Discusses meteorite ionization as a physical phenomenon in the ionosphere. After briefly summarizing its general nature, author deals with (1) the basic ionization

(produced directly along the moving line of the meteors) and (2) the secondary ionization (produced around the meteor itself by strong ultraviolet radiation). Visual meteor train observations give evidence of high wind velocities in the upper atmosphere and reference is made to the promising method recently advanced by MANNING, VILLARD and PETERSON (using the frequency shift in their Doppler record) to study this phenomenon. *Subject Headings: 1. Meteor ionization 2. Ionosphere.*—W.N.

6E-119

551.510.53:541.14

†Mitra, Sisir Kumar, **General aspects of upper atmospheric physics.** *U. S. Air Force, Cambridge Research Center, Geophysical Research Papers*, No. 11:19-54, 1952. 6 figs., 3 tables, 22 refs. **DWB**—Ch. 3 (Solar control of the upper atmosphere, p. 24-25) features a table of photochemical reactions of oxygen and nitrogen under the effect of solar radiation in various spectral regions from 3000Å to 585Å. (For fuller abstract see item 4.6-79, June 1953, *MAB*.) *Subject Headings: 1. Photochemistry of upper atmosphere 2. Upper atmosphere 3. Review articles.*—G.T.

6E-120

551.510.5(02):541.14

†Mitra, Sisir Kumar, **The upper atmosphere.** 2nd ed. Calcutta, The Asiatic Society, [Preface 1952]. 713 p. figs., tables, bibliog. p. 644-668, eqs. **DLC**—Ch. 5 of this fundamental work (p. 163-175) deals with the photochemistry of oxygen and nitrogen in the upper atmosphere. The thermal dissociation theory (an extension of Saha's thermal ionization theory) for O₂ molecules is developed according to RAKSHIT. The chapter on the ionosphere includes a section (p. 302-317) on electron production, decay and recombination. The different types of reactions taking place in the ionosphere and their coefficients are tabulated (p. 308-309). The section on nightglow and twilight flash (p. 534-543) deals with collision mechanisms leading to excitation. Origins of hydrogen and of sodium in the upper atmosphere are discussed (p. 543-548). Bibliographic references are given for each chapter. (For fuller abstract see item 4.8-15, Aug. 1953, *MAB*.) *Subject Heading: 1. Photochemistry of upper atmosphere.*—G.T.

6E-121

551.510.53:546.21

Moses, H. E. and Wu, Ta-you, **A self-consistent calculation of the dissociation of oxygen in the upper atmosphere.** *Physical Review*, New York, 87(4):628-632, Aug. 15, 1952. 4 figs., eqs. **DLC**—In a previous paper (see 6E-77) a self-consistent model was set up for the dissociation of oxygen in the upper atmosphere under the assumption of number balance and radiative energy balance and a form of the barometric equation. In the present paper a similar model is used, but the requirement of radiative energy balance is dropped and a temperature distribution is assumed. The resulting calculations indicate that for this model the dissociation region is much narrower than in the previous model and that it occurs at lower altitudes. (Same item as 4.4-86, April 1953, *MAB*.) *Subject Headings: 1. Oxygen dissociation 2. Upper atmosphere.*—Authors' abstract.

6E-122

551.510.53.5 551.594.5:551.593.5

Nicolet, M. and PASTIELS, R., **Atomic and molecular nitrogen in the high atmosphere.** *Société Royale des Sciences de Liège, Mémoires*, 4th Ser., 12(1/2):147-149, 1952. **DLC**—The presence of N₂ bands in auroral spectra indicates the existence of N₂ molecules above 200 km. Various mechanisms possibly accounting for this fact are considered and the conclusion is reached that "the presence of N₂ in the auroral rays should result from the recombination process of neutral and ionized atomic nitrogen and its presence at twilight at 100 km is explained by X-ray ionization." (Same item as 5C-213, March 1954, *MAB*.) *Subject Headings: 1. Recombination and dissociation in chemosphere 2. Nitrogen in upper atmosphere.*—G.T.

6E-123

551.510.535:551.510.41

*Nicolet, Marcel and Mange, P., **An introduction to the study of the physical constitution and chemical composition of the high atmosphere.** Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Ionospheric Research, Scientific Report, No. 35, April 15, 1952. 115 p. 22 figs., 13 tables, 62 refs., eqs. **DWB**—Pressure, temperature, density, chemical data and the nature of the equilibrium in the upper atmosphere and the terms in use in discussing these factors are defined and treated in detail according to the latest models and information. Composition as determined from balloon and rocket samples, airglow, auroral and ionospheric data, and as determined theoretically is given. The thermosphere and exosphere are also treated for the purpose of determining ionospheric behavior. A model with and one without molecular diffusion is presented for determining conditions above 160 km. *Subject Headings: 1. Upper atmospheric physics 2. Chemical composition of upper atmosphere 3. Ionospheric models 4. Exosphere.*—M.R.

6E-124

551.510.535:551.594.12

Purcell, E. M. (*Lyman Lab., Harvard Univ.*), The lifetime of the 2^2S_1 state of hydrogen in an ionized atmosphere. *Astrophysical Journal*, 11(3):457-462, Nov. 1952. table, foot-refs., 13 eqs. DWB—The probability of the transitions $2^2S_1 \rightarrow 2^2P_1$ and $2^2S_1 \rightarrow 2^2P_3$ resulting from collisions of hydrogen atoms in 2^2S_1 state with electrons and positive ions is calculated. The dominant effect of the protons is shown. The population of the $2S$ state under chromospheric conditions is found to be substantially lower than the estimates of GIOVANELLI, and the appearance of the line $2^2S_1 \rightarrow 2^2P_3$ in absorption is improbable. *Subject Headings: 1. Ionospheric ionization.—Author's abstract.*

6E-125

551.510.535:551.594.13

Rawer, K.; Bibl, K. and Argence, E., Mesures du nombre de chocs dans les régions E et F2 de l'ionosphère. [Measurements of the number of collisions in the E and F2 regions.] *Société Royale des Sciences de Liège, Mémoires*, Ser. 4, 12(1/2):269-280, 1952. 3 figs., 7 refs. DLC—Results of 32 measurements of the F2 layer made at night between Nov. 1949 and April 1950 and during Feb. 1951, on 4 frequencies; and another series on 5 frequencies at noon for two years (E region). Method of calculating collisions is described. The number of collisions thus calculated is smaller than most previous measurements gave, but the difference is explained as due to optical geometry. For the E layer 7×10^3 and for the F2 layer 2×10^2 compares with APPLETON's (10^4) and MITRA's (2×10^5) for the E layer. The F2 layer value of n is higher than that of NEWELL. The number of collisions is a measure of the ion density. *Subject Headings: 1. Ion density in E layer 2. Ion density in F2 layer 3. Ionospheric density.—M.R.*

6E-126

551.510.535:546.172.6.31

Rosen, B. (*Astrophysical Inst., Liège Univ.*), Quelques remarques sur l'énergie de dissociation de NO. [Remarks on the energy of dissociation of NO.] *Société Royale des Sciences de Liège, Mémoires*, Ser. 4, 12(1/2):317-319, 1952. DLC—Brief but technical discussion of the energy status of NO (absorption and emission) in dissociation and recombination, with application to upper atmosphere. *Subject Headings: 1. NO dissociation 2. Recombination processes.—M.R.*

6E-127

551.510.535:551.594.12

Sayers, J. (*Univ. Birmingham, Eng.*), Evidence on recombination processes from laboratory measurements on ionized gases (and discussion). *U. S. Air Force, Cambridge Research Center, Geophysical Research Papers*, No. 11:124-136, 1952. 5 figs., 9 refs. DWB—Results of laboratory measurements of electron recombination coefficients are presented graphically and discussed. Recombination measurements in Argon, the effect of diffusion and the significance of the results for ionospheric studies are also treated. Conclusion is that recombination coefficient is independent of pressure from .1 to 1.0 mm, indicating a two-body process for recombination. In the E layer the recombination coefficient is about 10^{-8} cm³/sec. In F2 region where gases are likely dissociated to a higher degree, the recombination coefficient is about 2 or 3×10^{-10} cm³/sec, which agrees well with laboratory measurements. *Subject Headings: 1. Ionosphere 2. Recombination processes 3. Ionized media.—M.R.*

6E-128

551.510.535:541.14 551.52.14

Swings, P. and Meinel, A. B., The spectra of the night sky and the aurora. (In: Kuiper, Gerard P. (ed.), *The atmospheres of the earth and planets*. Rev. ed. Chic., Univ. of Chic. Press, 1952. p. 159-210. figs., table, refs., eqs.) DWB—Section C (Interpretation of observations, p. 193-210), deals with the abundance of nitrogen atoms in the upper atmosphere (discussion of dissociation processes producing N); the photodissociation of O₂ molecules; ionization mechanisms; mechanism of excitation of infrared night sky emission; conversion of dissociation energy into excitation energy; auroral excitation mechanisms. (For fuller abstract see item 5C-224, March 1954, MAB.) *Subject Headings: 1. Auroral spectra 2. Night airglow spectrum 3. Photochemistry of upper atmosphere.—G.T.*

1953

6E-129

551.510.535:537.56

Appleton, Edward V., A note on the "sluggishness" of the ionosphere. *Journal of Atmospheric and Terrestrial Physics*, 3(5):282-284, June 1953. ref., 13 eqs. MH-BH—The physical effect of recombination or attachment of electrons is to delay the response of changes in electron density to changes in rate of electron production. The effect in ionospheric measurements is discussed and the value of αN (α =recombination coefficient) are calculated for D, E, and F layers. (Same item as 4.11-95, Nov. 1953, MAB.) *Subject Headings: 1. Ionospheric variations 2. Electron density.—C.E.P.B.*

6E-130

551.510.535:551.594.12

Bauer, Ernest and Wu, Ta-you, **The origin of the E layer of the ionosphere.** New York Univ. Washington Square College. Mathematics Research Group, Contract AF 19(122)-463, Research Report, No. CX-9, July 1953. 11 p. figs., tables, 10 refs., 33 eqs. **MH-BH.** Also in: *Physical Review*, 92(5):1101-1105, Dec. 1, 1953. fig., tables, 10 refs., 33 eqs. **DLC**—The electron concentration in the E layer has been calculated as a function of height according to the theory of the pre-ionization of molecular oxygen by the sun's radiation (NICOLET) and subsequent dissociative recombination (BATES and MASSEY). The calculations are based on the recent work of MOSES and WU on the distribution of molecular and atomic oxygen in the atom-molecule transition region. It is shown that both the observed height and the value of the peak electron density can be accounted for satisfactorily. We also examine the photoionization of atomic oxygen, which leads to a peak in the region of the F1 layer on the basis of theory involving atomic and molecular oxygen alone. *Subject Headings:* 1. E layer 2. Electron density 3. Ionization processes.—*Authors' abstract.*

6E-131

551.510.534:541.14

Dütsch, H. U., **Das Ozon in der Erdatmosphäre. Vorkommen und Bedeutung.** [The ozone in the earth's atmosphere. Occurrence and importance.] *Umschau*, 53(7):195-197, April 1, 1953. 5 figs. **DLC**—Summary of selective absorption by O₃, distribution by latitude and months, vertical distribution, relation to young depressions and to anticyclones. Processes of formation and destruction are described, relation to solar eruptions and possible use in long range forecasting mentioned. (Same item as 4.8-80, Aug. 1953, MAB.) *Subject Headings:* 1. Ozone distribution 2. Ozone photochemistry.—*C.E.P.B.*

6E-132

551.510.535:551.521.4

Dufay, Jean; Berthier, Pierre and Morignat, Bernard, **Nouvelle évaluation de l'altitude de la couche atmosphérique émettant la raie verte de l'oxygène dans la lumière du ciel nocturne.** [Re-evaluation of the height of the atmospheric layer emitting the green line of oxygen in nightglow.] *Académie des Sciences, Paris, Comptes Rendus*, 237(15):828-830, Oct. 12, 1953. 11 refs. **DWB**—Spectrophotographic measurement of intensity relations of the green line of oxygen at zenithal angles of 78.5° and 11.5° indicate a height of emission amounting to approximately 250 km (F2 region). *Subject Headings:* 1. F2 layer 2. Night sky spectroscopy 3. Oxygen in upper atmosphere.—*Transl. of authors' abstract.*

6E-133

551.594.12:551.510.535

†Inn, Edward C. Y. (U. S. A. F., Cambridge Res. Center), **Photoionization of molecules.** U. S. Air Research and Development Command, First Annual Science Symposium, Eglin Air Force Base, Florida, May 18-20, 1953. p. 12-15, [1953]. 3 figs., 16 refs. **DWB**—A review of progress made at the Air Force Cambridge Research Center in studying the role of photoionization in the structure and composition of the upper atmosphere. The two methods in current use to measure ionization potentials of molecules (such as O₂, NO, NH₃, SO₂, C₂H₄, CH₂I, CH₃OH and C₂H₅Br) are: 1) electron impact and 2) Rydberg series measurements. The latter is difficult. A third, the method used by A.F.C.R.C., involves measuring the threshold for photoionization, as this enables measurement of ionization cross sections. Results obtained by the author and those obtained by others are compared in tabular form for the above mentioned gases. Further detailed studies support theory of origin of D layer. (Same item as 5.9-11, Sept. 1954, MAB.) *Subject Headings:* 1. Photoionization of molecules 2. Ionospheric composition 3. D layer origin.—*M.R.*

6E-134

551.510.534:06 551.510.41:06

International Symposium on Atmospheric Ozone, Univ. of Oxford, Sept. 2-4, 1952, **Proceedings. International Union of Geodesy and Geophysics, Bulletin d'Information**, 2(2):295-322, April 1953. **DWB**—Lists members of International Ozone Commission and others who attended conference and presents comprehensive abstracts of papers by G. M. B. DOBSON, SIR CHARLES NORMAND, R. H. KAY, G. F. WALTON, R. M. GOODY, H. V. DÜTSCH, A. W. BREWER and C. D. WALSHAW, and discussion at each symposium. The main headings for the discussion were: 1) Instruments and observation techniques; 2) Vertical distribution of O₃; 3) Photochemical theory of O₃ formation; 4) O₃ and the general circulation of the atmosphere; 5) O₃ and weather changes, and 6) O₃ and stratosphere temperatures. Conclusion was that O₃ variations are associated to a high degree with long-wave pattern of the atmosphere with ozone high in troughs and low in ridges. Whether advection or vertical motion is the cause is not clear. (Same item as 5.9-110, Sept. 1954, MAB.) *Subject Headings:* 1. Ozone layer 2. Ozone conferences 3. Ozone photochemistry. I. I.U.G.G. International Ozone Commission.—*M.R.*

6E-135

551.510.53

Kallmann, H. K., **Physical properties of the atmosphere between ~80 km and ~250 km.** *Journal of Geophysical Research*, 58(2):209-217, June 1953. 2 figs., 2 tables, 10 refs., 19 eqs. **MH-BH**—Calculated values of temperature, pressure, molecular weight and density are given in tables and graphs for each 10 km from 80 km to 250 km. The theory is based on relation between fractional change of concentration with change of height. It is assumed that molecular oxygen dissociates between 80 km and 120 km and molecular nitrogen between 130 and 250 km. (For fuller abstract see item 5.8-92, Aug. 1954, *MAB.*) *Subject Headings*: 1. Standard atmosphere 2. Oxygen dissociation 3. Nitrogen dissociation 4. White Sands Proving Grounds, N. M.—*M.R.*

6E-136

551.510.535:546.33

†Miller, Lewis E., **Sodium in the upper atmosphere.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 43, June 1953. 94 p. 3 figs., 4 tables, eqs. Section of abstracts p. 23-91. **DWB**—A thorough survey with substantial abstracts of literature concerned with the origin, distribution, measurement and other aspects of sodium in the upper atmosphere. Many good references to basic theories on photochemical reactions involved in the formation of upper atmosphere sodium are included. (*Same item as 5.9-7*, Sept. 1954, *MAB.*) *Subject Heading*: 1. Sodium in upper atmosphere.—*G.T.*

6E-137

551.510.535:541.12

†Mitra, A. P. and Jones, R. E., **Theoretical and experimental study of the recombination coefficient in the lower ionosphere.** Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 44, March 25, 1953. 74 p. 3 tables, 17 figs., 62 refs., 46 eqs. **DWB**—The problem of the recombination of electrons and ions in the lower ionosphere is studied in two parts. Firstly, experimentally derived values of the effective recombination coefficient α are tabulated and new values are calculated from ionospheric data both published and unpublished. Secondly, the theories of recombination are reviewed and a theoretical model is derived which is consistent with the empirical results, including those obtained from laboratory experiments. From the study of recombination during solar flares it has been possible to identify the height of the ionospheric current system responsible for geomagnetic solar flare effects. (*Same item as 5.5-91*, May 1954, *MAB.*) *Subject Headings*: 1. Recombination processes 2. Ionospheric currents 3. Solar flares.—*Authors' abstract.*

6E-138

551.510.535:551.507.362

*†Newell, Homer E., Jr., **High altitude rocket research.** New York, Academic Press, 1953. 298 p. 93 figs., 37 tables, numerous refs. Price: \$7.50. **DLC**—Ch. 7, Composition of the high atmosphere, contains a comparison of ozone data, obtained in rocket flights, with various theoretical ozone determinations (with good agreement above 35 km; p. 193-197). The dissociation of atmospheric oxygen is discussed (p. 201-202). The solar intensity curve between 1450 and 1530 Å appears to support the assumption that oxygen is completely dissociated above 120 km. (For fuller abstract see item 5.5-7, May 1954, *MAB.*) *Subject Headings*: 1. Oxygen dissociation 2. Upper atmosphere.—*G.T.*

6E-139

551.590.21:551.510.3:537.56

Nicolet, M., **Actions de l'atmosphère terrestre sur les équilibres de photo-dissociation et de photo-ionisation par le rayonnement ultraviolet et X du soleil.** [The effect of the terrestrial atmosphere on the equilibrium of photodissociation and photoionization by ultraviolet and X rays.] *International Council of Scientific Unions, Brussels, Commission for the Study of Solar and Terrestrial Relationships, Rome, Sept. 1952, Report*, No. 8:23-24, pub. 1953. 2 eqs. **DWB**—Equations of equilibrium should include tidal effects, advective and dynamic effects and diffusion of gases in the gravity field. Above 160 km diffusion is so rapid as to establish diffusive equilibrium. Advection is active at 100-140 km and O₂ follows the vertical distribution of other elements. Hence relations between solar and terrestrial phenomena are more complex than the simple equilibrium due to photodissociation and photoionization. (*Same item as 5.8-267*, Aug. 1954, *MAB.*) *Subject Headings*: 1. Solar influences 2. Ionospheric ionization 3. Photochemical equilibrium.—*C.E.P.B.*

6E-140

551.510.41:546.17

†Nicolet, Marcel, **Aeronomic problem of nitrogen oxides.** Pennsylvania State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 52, Oct. 25, 1953. 36 p. 64 refs., 44 eqs. **DWB**—Dissociation of nitrogen molecules depends strongly on the photoionization by ultraviolet or X-ray radiation and subsequent dissociative recombination. The vertical distribution of nitrogen atoms cannot be studied by a dissociation equilibrium, since it is subjected to dynamic effects such as diffusion and atmospheric mixing. Whatever process may be involved in the formation of nitric oxide, its vertical distribution will tend to follow the atmospheric

distribution until it becomes dissociated. A departure from equilibrium cannot occur for nitrogen peroxide molecules, for their life-time in a sunlit atmosphere is very short. The processes in the chemosphere lead to various possibilities with regard to contributions of nitrogen oxides in the airglow. Reactions leading to an excitation of an O_2 atmospheric band system are also discussed. In anticipation of the importance attached to the aeronomical problem of nitrogen oxides in the mesosphere and lower thermosphere, various provisional numerical data are given. (Same item as 6.3-90, March 1955, MAB.) *Subject Headings:* 1. Atmospheric composition 2. Nitrogen compounds 3. Night airglow.—From author's abstract.

6E-141

551.510.534

Paetzold, Hans-Karl, Die atmosphärische Ozonschicht und ihre vertikale Verteilung. [The atmospheric ozone layer and its vertical distribution.] *Umschau*, 53(23):715-717, Dec. 1, 1953. 4 figs. DWB—The reactions between O molecules and UV light resulting in formation and destruction of ozone are set out; these give maximum O_3 at about 23 km. Recent upper air measurements are described and their results discussed. In spring there is a second maximum at 10-16 km; due to transport from a polar reservoir. Conditions on Mars are compared. (Same item as 5.4-87, April 1954, MAB.) *Subject Headings:* 1. Ozone distribution 2. Ozone photochemistry.—C.E.P.B.

6E-142

551.510.534

Paetzold, Hans-Karl, The mean vertical ozone distribution resulting from the photochemical equilibrium, turbulence and current of air. *Journal of Atmospheric and Terrestrial Physics*, 3(3): 125-131, April 1953. 6 figs., 2 tables, 23 refs. MH-BH—Vertical distribution and amount of ozone are calculated on four assumptions of solar radiation of 2100 Å and spectral pressure coefficient of absorption by O_2 . The average distribution is best fitted by ratio solar radiation black body at 2100 Å = 0.03 and O_2 absorption proportional to $p^{1.4}$, and by downward transport of ozone by turbulent exchange, greatest at the equator. Double maximum sometimes found is attributed to accumulation in Arctic air masses which drift S losing height. (Same item as 4.8-82, Aug. 1953, MAB.) *Subject Heading:* 1. Ozone distribution.—C.E.P.B.

6E-143

551.510.535

†Rawer, Karl and Argence, E., Considérations critiques relatives à la formation de la région E de l'ionosphère. [Critical considerations on the formation of the ionospheric E region.] *Annales de Géophysique*, 9(1):1-25, Jan. March 1953. 14 figs., table, 44 refs., eqs. MH-BH—A good source of information regarding the general theory of formation of ionized regions and experimental results for the height of the E layer. The formation of this layer can be explained by photo-ionization of O_2 , if this constituent is dissociated at an altitude of about 130 km. X-rays of solar origin produce also some ionization, but an analysis of coronal emission resulted in a too high ionization between 95 and 110 km. Graphical information is given on the molecular and electron density as a function of altitude, on the vertical distribution of temperature, depending above 100 km on different assumption regarding the dissociation of oxygen alone, oxygen and nitrogen, or no dissociation at all. *Subject Headings:* 1. E layer origin 2. Upper atmosphere 3. Molecular density 4. Electron density.—A.A.

6E-144

551.510.535

Rawer, Karl, Die Ionosphäre. Ihre Bedeutung für Geophysik und Radioverkehr. [The ionosphere. Its importance in geophysics and radio communication.] Groningen, 1953. 179 p. 67 figs., 143 refs., 68 eqs. DLC—The chapter on the theory of the formation of ionospheric layers (p. 70-91) includes a brief review of various possible ionization and recombination processes. The dissociative recombination theory advanced by BATES and MASSEY is discussed in particular. (For fuller abstract see item 6D-297, April 1955, MAB.) *Subject Headings:* 1. Ionization processes 2. Recombination processes 3. Ionosphere.—G.T.

6E-145

551.510.535:016

†Resnik, Robert and Stein, Stanley, The spectra and chemical kinetics of the upper atmosphere. A literature survey. Pittsburgh. Univ. Spectroscopy Laboratory, Contract AF 19(122)-478, Scientific Report, No. 1, Pts. 1-6, October 31, 1952-Aug. 10, 1953. 6 pieces. DWB—Contents: Pt. 1, Subject Classification; Pts. 2-4, Author classification; Pt. 5, Subject Classification (of supplementary material); Pt. 6, Author classification (of supplementary material). Sec. 4 of Pts. 1 and 5 (subject classification) contains over 900 references to the ionosphere (spectra and constituent interactions only). A list of journals cited is appended to each part. Abstracts of varying lengths are included for about $\frac{2}{3}$ of the citations in the author classification parts. (Same item as 5.7-11, July 1954, MAB.) *Subject Headings:* 1. Upper atmosphere bibliographies 2. Ionosphere bibliographies.—M.R.

6E-146

551.510.535

Watanabe, K.; Marmo, Frederick and Inn, Edward C. Y., **Formation of the D layer.** *Physical Review*, 90 (1):155-156, April 1, 1953. fig., table, 12 refs. **DLC**—Recent measurement of absorption cross-sections indicate that the most likely process responsible for the formation of the D layer is photoionization of nitric oxide (λ 1100-1300) rather than of molecular oxygen (λ 900-1000). The ionization cross-section of NO is about 25 times larger than the value estimated by BATES (1930): ionization by Lyman α is particularly important. A table is given on absorption cross-sections of various atmospheric gases at Lyman α . *Subject Headings: 1. D layer origin 2. Ionospheric ionization.*—*Physics Abstracts*, No. 5236, 1953.

6E-147

551.510.535:551.594.12

Yonezawa, Toshiyuki (*Radio Res. Lab., Tokyo*), **A consideration of the mechanism of electron removal in the F2 layer of the ionosphere.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere in Japan*, 7 (1):15-29, 1953. 14 refs., 21 eqs. **DWB**—A mechanism of electron removal in the F2 region, which consists in the transformation of atomic ions into molecular ones through charge transfer and the subsequent recombination of the latter ions with electrons, has been considered. It has been concluded that, although this mechanism may be capable of interpreting the attachment type of electron removal, it can hardly explain quantitatively the value of attachment coefficient, and besides, there remains a discrepancy between theory and observation concerning the value of scale height associated with the decrease in attachment coefficient with height. *Subject Headings: 1. F2 layer 2. Recombination processes.*—*Author's abstract.*

6E-148

551.510.535:535.568

Yonezawa, T. (*Science Council, Japan*), **Some observational facts concerning atomic processes in the ionosphere.** *International Council of Scientific Unions. Mixed Commission on the Ionosphere, Third meeting, Canberra, Australia, Aug. 24-26, 1952, Proceedings*, p. 126-135, pub. 1953. 9 figs., 8 refs. **DWB**—A discussion of electron disappearance during the night in the F2 region (recombination and attachment theories) and relation between electron production and disappearance during daytime. Fig. 1 shows relation between recombination coefficient and the reciprocal of electron density at sunset at Washington (based on ionospheric data for March, June and Sept. 1934-1950); figs. 2-6 show relative temperature variation of the upper atmosphere at Kokubunji (Dec. 1947, Jan.-Feb., March and June 1948). A comparison of electron density variations at Kokubunji and Yamagawa was also made. Concludes "that the rate of electron disappearance is of attachment type during the night in the F2 region"; relation between electron production and disappearance during daytime not determined. *Subject Headings: 1. Recombination processes 2. F2 layer 3. Washington, D. C. 4. Japan.*—*M.L.R.*

1954

6E-149

551.594.51 551.510.535:541.14

Bates, David R. (*Queen's Univ. Belfast*), **Atomic and molecular processes.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 30:321-339, July 1954. fig., 6 tables, 32 refs., 37 eqs. Discussion p. 333-337. **MH-BH**—Various atomic and molecular processes likely to be of importance in the high atmosphere (and particularly in the aurorae) are discussed. The reactions giving rise to the main auroral emissions are considered. The importance of recombination processes (which must give a light emission comparable to that from direct excitation) is emphasized. The velocity distribution of the electrons in the auroral zone is investigated theoretically. It is found that only a minute fraction of these electrons can have energies in excess of thermal energy. The importance of this in connection with theories on the origin of aurorae is indicated. The photochemistry of certain atmospheric constituents (carbon dioxide, carbon monoxide, methane, and nitrous oxide) is investigated. Originally, the aim of this study was to obtain information on the altitude distribution of the polyatomic molecules. *Subject Headings: 1. Auroral theories 2. Recombination processes 3. Photochemistry of upper atmosphere.*—*From author's abstract.*

6E-150

551.510.535:551.594.12

Bates, D. R., **Consideration of the results obtained by rockets.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), *Rocket exploration of the upper atmosphere*. London, Pergamon, 1954. p. 347-356. 39 refs., 3 tables, 11 eqs.) **DWB**—The measurements made during recent rocket flights are examined critically from the view-point of the theorist. It is contended that the large concentrations of ions reported in the D and E layers are suspect. The temperatures and particle concentrations claimed for the thermosphere, though considerable, are lower than anticipated. However, as far as can be judged at present, they are not necessarily in conflict with other evidence. Little weight can be attached to most of the arguments which led originally to the expectation of higher values. *Subject Headings: 1. Ion concentration 2. Atmospheric structure 3. Upper atmosphere.*—*Author's abstract.*

6E-151

551.594.51:546.17

*Brook, Marx and Kaplan, Joseph, **The dissociation energy of NO and N₂**. California. Univ. at L. A. Institute of Geophysics, Contract AF 19(122)-454, Scientific Report, No. 3, July, 1954. 4 p. 3 figs., table, 4 refs. **MH-BH**—The vibrational levels of the $X^2\Pi$ ground state of NO have been observed up to $v=23$, or an energy of 4.46 e.v. In order that $D_0(\text{NO})$ be 5.29 e.v., a very sharp and sudden drop in the $\Delta G(v)$ values is necessary. No such tendency is observed, and therefore the higher value of $D_0(\text{NO})=6.48$ e.v. appears most probable. This value then fixes $D_0(\text{N}_2)=9.76$ e.v. A new system of NO bands in the near infrared is reported. These are probably due to a $^4\Pi \rightarrow ^4\Pi$ transition. *Subject Headings: 1. Nitrogen dissociation 2. Nitric oxide dissociation.—Authors' abstract.*

6E-152

551.594.51:546.11:535.3

Chamberlain, Joseph W. (*Yerkes Obs.*), **The excitation of hydrogen in aurorae**. *Astrophysical Journal*, 120(2):360-366, Sept. 1954. 3 figs., refs., 6 eqs. **DLC**—The Balmer emission produced when protons penetrate the atmosphere during an aurora is investigated by the method of statistical equilibrium. The $H\alpha$ luminosity versus height is computed for several incident proton energies and is compared with computations for the luminosity distribution in other emissions. It is found that each incident proton should produce a total of about 50 quanta of $H\alpha$, which leads to a rough estimate for the proton flux of about $6 \times 10^{17} \text{ cm}^{-2} \text{ sec}^{-2}$ during the arc stage of a moderately strong aurora. The Balmer decrement is computed, and the theoretical $H\alpha$ profile for an arc in the magnetic zenith is compared with MEINEL's observed profile. This comparison suggests that the incident protons undergo considerable scattering, which produces a rather large effect on the observed profile and the luminosity distribution. *Subject Headings: 1. Auroral energy excitation mechanisms 2. Auroral hydrogen lines 3. Balmer lines.—Author's abstract.*

6E-153

551.510.535:551.594.12

Chapman, Sydney, **A monochromatically ionized layer in a non-uniformly recombinant atmosphere; with applications to the D and E ionospheric regions**. *Physical Society of London, Proceedings, Ser. B*, 67(9):717-727, Sept. 1, 1954. 5 figs., 16 refs., 29 eqs. **DWB**—Ionization of an exponential atmosphere by monochromatic solar radiation is considered when the recombination α is not independent of height but varies as $\alpha_0 + \alpha_1 e^{-bh}$, where α_0 , α_1 and b are constants. A *recombination datum* level is defined, namely, the level where α_0 and $\alpha_1 e^{-bh}$ are equal: heights are measured from this level, in scale-height units. The level of the *absorption peak* being z_χ (when the sun's zenith distance is χ , or z_0 when $\chi=0$), the level z_m of the electron peak and the height distribution of the electron density n_e are considered, for different values of z_0 and of $c(=b/H)$, particularly $c=1, 2, 3$. When $c>0$ the electron peak is always above the absorption peak, and for $c \geq 2$ it is always above the recombination datum level: the electron peak for $c=1$, when the absorption peak is below the recombination datum level, is about half way between the two. The decrease of n_e (from its maximum value n_{em}) on the underside (or incline) of the electron layer can be much less steep than for a Chapman layer, if the absorption peak is below the recombination datum level. The results for the model atmospheres considered are tentatively discussed with reference to the E and D ionospheric regions, but their potential value may be realized only when better data for the D region become available. *Subject Heading: 1. Ionospheric structure.—Author's abstract.*

6E-154

551.510.535:551.594.12

Chatterjee, B. (*Inst. of Radio Physics & Electronics, Univ. of Calcutta*), **Ionization distribution in the F-region**. *Indian Journal of Physics*, Calcutta, 28(2):53-66, Feb. 1954. 5 figs., 14 refs., table, eqs. **DLC**—The height distribution of ionization in the composite F region is calculated on the assumptions that the scale height (i.e., the temperature) increases and the recombination coefficient decreases with height in this region. The recombination coefficient is assumed to vary in terms of the reduced height, that is the height (above F1 max.) measured in terms of the scale height and not in terms of the actual height as had been done earlier by A. P. MITRA in making similar calculations. The present assumption automatically takes into account the effect of rising temperature on the value of the recombination coefficient. Height distribution curves for high and low latitude stations are drawn for typical summer and winter conditions in the high atmosphere in the F region. It is found that when the possible effects of ionospheric tidal drifts are taken into account, the forms of the distribution curves, also the separation between the F1 and F2 layers, agree with those deduced from observational data. The investigation lends support to the hypothesis that the ionospheric regions F1 and F2 belong to a common bank of ionization produced by a common ionizing radiation from the sun. *Subject Headings: 1. F layer ionization 2. Recombination processes 3. Recombination coefficient 4. Ionospheric structure.—Author's abstract.*

6E-155

551.510.535

Gerson, Nathaniel C., **Energy and duration of a sudden ionospheric disturbance**. *Geofisica Pura e Applicata*, 27:156-158, 1954. English and German summaries p. 156. **MH-BH**—Assuming

that all of the ionization in a SID (sudden ionospheric disturbance) is caused by a marked increase in Lyman α radiation from the sun, and that this energy ionizes a fraction β of all atomic oxygen down to 100 km, and that from 94 to 100 km the O_2 dissociates, and finally that below 94 km the oxygen is completely molecular, the author calculates the number of oxygen atoms N embraced in the sunlit angle of 160° and confined in a given layer (e.g., 100–1000 km, or 70–100 km) and then the energy required to dissociate all to the O_2 and to ionize the fraction β from 70–1000 km. Several possible energy absorption values can be obtained depending on percent of O and O_2 ionized to a given depth. One figure is 5.65×10^{27} ergs if one assumes total ionization of oxygen to 94 km and of 10^6 molecular oxygen atoms from 94 to 70 km. Duration of 10^2 to 10^4 seconds is calculated, depending on recombination coefficient used. *Subject Headings:* 1. Ionization processes 2. Sudden ionospheric disturbances.—M.R.

6E-156

551.510.534:551.524.7:551.507.362

Johnson, Francis S., **Rocket observations of atmospheric ozone.** (In: American Meteorological Society and Royal Meteorological Society, *Proceedings of the Toronto Meteorological Conference*, Sept. 9–15, 1953. pub. 1954. p. 17–26. 11 figs., table, 18 refs.) DWB—Measurements of atmospheric ozone concentration have been made from rockets at altitudes up to 70 km. The results have been compared with distributions calculated from photochemical theory, and the agreement is good if the three-body collision process $O+O+M \rightarrow O_2+M$ is taken into account. The absorption of solar radiation by ozone has been used to calculate the diurnal temperature changes in the altitude range 30 to 70 km above White Sands, New Mexico, for 14 June 1949 and 25 January 1951. The maximum diurnal temperature variation occurs at about 50 km altitude, in agreement with the altitude of the temperature maximum as calculated from rocket measurement of pressure and density. (Same item as 6.3–53, March 1955, MAB.) *Subject Headings:* 1. Ozone distribution 2. Upper air temperature variations 3. Rocket soundings 4. White Sands Proving Grounds, New Mexico.—Author's abstract.

6E-157

551.510.535:541.14

†Mange, P., **Diffusion and dissociation of molecular oxygen in the atmosphere above 100 km.** Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 64, June 15, 1954. 64 p. 11 figs., bibliog. p. 63–64, eqs. MH-BH—As a result of a thorough analysis of photochemical processes and of diffusion, the vertical distribution of molecular oxygen above 100 km is determined. Diffusion is found to play a decisive part in the oxygen balance of the upper atmosphere. Previous calculations made on the assumption of photochemical equilibrium, and leading to the belief that molecular oxygen is negligible above 120 km, are found to be erroneous. The molecular oxygen concentration obtained for 160 km is 10,000 times greater than hitherto calculated. *Subject Headings:* 1. Photochemistry of upper atmosphere 2. Oxygen photochemistry.—G.T.

6E-158

551.510.535

†Massey, H. S. W. (Univ. College, London), **Laboratory methods of investigating processes important in the high atmosphere.** U. S. Air Force. Cambridge Research Center, *Geophysical Research Papers*, No. 30:205–220, July 1954. 3 figs., 41 refs., 11 eqs. Discussion p. 217–218. MH-BH—A number of investigations on the nature of the individual processes occurring in the aurora are in progress at University College, London, England. These examinations include studies of (a) charge exchange between positive ions and neutral molecules; (b) collision detachment of electrons from negative ions on collision with neutral molecules; (c) transfer of excitation between atoms on impact; and (d) excitation of light by impact of electrons (and of positive ions) with atoms and molecules. A technique for studying the collision properties of atomic oxygen is being developed. A further line of attack on the auroral problem is the use of recently developed probe techniques to study electric discharges in electronegative gases. The aim in this case is the detailed investigation of the processes of gain and loss of ions and electrons. The nature of the experiments now in progress, the results obtained to the present, and their relation to upper atmospheric phenomena (particularly to the aurora and the airglow) are discussed. *Subject Headings:* 1. Electronic processes 2. Ionic processes 3. Upper atmosphere.—From author's abstract.

6E-159

551.510.41:551.507.362

Michigan Univ. Upper Atmosphere Research Project, **The measurement of diffusive separation in the upper atmosphere.** (Paper presented by L. M. Jones.) (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), *Rocket exploration of the upper atmosphere*. London, Pergamon, 1954. p. 143–156. 12 figs., 4 tables, 13 refs.) DWB—The experimental technique of collecting samples of the upper atmosphere in steel bottles carried aloft in rockets is described. The samples collected were analysed primarily for helium, neon, argon, and nitrogen. The presence or lack of diffusive separation is based on the ratio of the relative abundance of the first three with respect to

nitrogen in the samples to the relative abundance in ground air. The samples fall into three categories: (a) those collected in early V-2's up to 70 km. No separation was detected but the samples are in doubt because of possible contamination by ground air. (b) Samples collected up to 60 km in Aerobees. These are thought to be valid samples, and the analyses show no separation up to 60 km. (c) The most recent samples collected in Aerobees and one V-2 up to 100 km. In these samples separation increasing with the mass difference and with altitude was detected. However, small amounts of separation detected in ground air control bottles associated with these latter samples throw some doubt on the results. Further work is in progress. *Subject Headings:* 1. Atmospheric composition 2. Rocket sampling 3. Diffusive separation of atmospheric constituents. I. Jones, L. M.—*Author's abstract.*

6E-160

551.510.535:541.12

Mitra, A. P., **Nocturnal recombination processes in the lower ionosphere.** Pennsylvania. State Univ. Ionosphere Research Laboratory. Contract AF 19(122)-44, Scientific Report, No. 68, Sept. 1, 1954. 76 p. 34 figs., 4 tables, 13 refs. **MH-BH**—This report is a continuation of an earlier work by MITRA and JONES on the general subject of recombination of electrons and ions in the lower ionospheres, and deals specifically with the *nocturnal* recombination processes over a height range of 80-120 km. An empirical model of the effective recombination coefficient at night is first obtained by critical analysis of various ionospheric data involving the heights and electron densities of the lower ionosphere. It is found that around 80 km the effective recombination coefficient increases appreciably immediately after sunset, but at higher levels the coefficient decreases. There is both height and time variation of the coefficient. Theoretical interpretation of these results is based fundamentally on the idea, first put forward by NICOLET, that an appreciable number of an atomic ion of low ionization potential exists in the lower ionosphere. While the positive molecular ion disappears rapidly through dissociative recombination with electrons, the positive atomic ions disappear very slowly. *Subject Headings:* 1. Recombination processes 2. Electron density 3. Ionosphere.—*Author's abstract.*

6E-161

551.510.535

Mitra, A. P. and Jones, R. E., **Recombination in the lower ionosphere.** *Journal of Geophysical Research*, 59(3):391-406, Sept. 1954. 6 figs., 36 refs., eqs. Append. p. 405. **MH-BH**—Phase height, polarization and absorption at 150 kc/sec, involving ionization of the lower regions were measured, determining the recombination of electrons and ions. The ionospheric recombination coefficient is tentatively computed over the range of 60-110 km, using the delay of noontime maximum and the diurnal variation of an ionospheric parameter (according to APPLETON). The results are compared with the theory of negative ions up to 80 km and the dissociative recombination theory above 90 km height. Experimental and theoretical values show a reasonable agreement. In addition the recombination during sudden ionospheric disturbances is discussed. *Subject Headings:* 1. Ionospheric recombination 2. Ionospheric disturbances 3. Recombination coefficient.—A.A.

6E-162

551.510.535:546.17

†Mitra, A. P., **A tentative model of the equilibrium height distribution of nitric oxide in the high atmosphere and the resulting D-layer.** *Journal of Atmospheric and Terrestrial Physics*, 5(1):28-43, March 1954. 12 figs., 3 tables, 50 refs., 17 eqs. **DWB**. Also issued as: Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 46, May 15, 1953. 57 p. **DWB**—Possible photochemical reactions in the height range 50-100 km are discussed, involving ozone, nitrogen, oxygen and nitrous oxide. The resulting equilibrium distribution of nitric oxide depends on the types of O and N_2O distribution assumed. A maximum NO concentration of less than $2 \times 10^{12} \text{ cm}^{-3}$ occurs within 85-95 km. The D layer can be adequately explained by this process. (Same item as 5.9-111, Sept. 1954, *MAB*.) *Subject Headings:* 1. Photoionization 2. Photochemistry of upper atmosphere 3. Nitric oxide 4. D layer origin.—A.A.

6E-163

551.510.41:546.21

Nicolet, Marcel, **The aeronomic problem of oxygen dissociation.** *Journal of Atmospheric and Terrestrial Physics*, 5(3):132-140, July 1954. 4 figs., 2 tables, 17 refs., 11 eqs. **DWB**—An expression for vertical distribution of molecular oxygen is derived, including a parameter X. Rocket observations give a slow decrease in number of O_2 molecules between 108 and 118 km, giving $X = 1.28$. Photochemical equilibrium would require $X = 2.92$, hence atmospheric mixing or diffusion must be operative. Curves are calculated for number of O_2 mol/cc from 110-350 km for $X = 1$ (mixing), 1.28 (diffusion), 3 (photo-equilibrium at 4500°K) and intermediate values. The region 85-120 km is more closely examined under various assumptions. The bearing on the ionosphere is discussed. (Same item as 6.3-89, March 1955, *MAB*.) *Subject Headings:* 1. Atmospheric composition 2. Upper atmosphere 3. Oxygen distribution 4. Oxygen dissociation.—C.E.P.B.

6E-164

551.510.535:541.1:546.21

Nicolet, Marcel, **Atmospheric motions and the dissociation of oxygen in the high atmosphere.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), *Rocket exploration of the upper atmosphere*. London, Pergamon, 1954. p. 357-360. 2 tables, 12 refs., 10 eqs.) DWB—By studying the departure from conditions of photochemical equilibrium, it is found that the molecular oxygen distribution between 100 km and 150 km follows the distribution of the main atmosphere and depends on mixing effects. The concentration of O_2 molecules is $1/(125 \pm 25)$ of the global concentration. *Subject Heading: 1. Oxygen dissociation.—Author's abstract.*

6E-165

551.510.535:546.17

Nicolet, Marcel, **Diffusion of nitrogen atoms and oxygen molecules in region F.** (In: Boyd, R. L. F.; Seton, M. J. and Massey, H. S. W. (eds.), *Rocket exploration of the upper atmosphere*. London, Pergamon, 1954. p. 361-365. 16 refs., 15 eqs.) DWB—The dissociation of nitrogen molecules due to photo-ionization and subsequent dissociative recombination has a peak near 160 km for an overhead sun. Starting with a molecular nitrogen-atomic oxygen atmosphere, the yield of nitrogen atoms is obtained. The velocity of diffusion is downwards at the production peak. Below 200 km nitrogen atoms move downward at an approximately constant velocity of 1 m per sec. before recombining. Such a result indicates an increase in the effective rate of production of atomic nitrogen at lower heights and shows that all the nitrogen molecules cannot be dissociated. In region F the loss of oxygen molecules is balanced by an upward diffusive transport. Adopting numerical data which give a minimum value for the efficiency of diffusion, it is shown that a vertical diffusive equilibrium can exist above 160 km. Such a result indicates that the molecules involved in charge transfer reactions and subsequently destroyed by dissociative recombination, are replenished by upward diffusion. *Subject Headings: 1. Photochemistry of upper atmosphere 2. Nitrogen dissociation.—Author's abstract.*

6E-166

551.510.53:541.14

Nicolet, M. and Mange, P., **The dissociation of oxygen in the high atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 59(1):15-45, March 1954. 11 figs., 9 tables, 35 refs., 49 eqs. MH-BH. Also as: Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(122)-44, Scientific Report, No. 56, Feb. 1, 1954. DWB—Molecular oxygen distribution above the dissociation region follows the distribution of the main atmosphere and depends on mixing effects. A limit for the time of mixing can be found when times of dissociation, recombination and diffusion are considered. It is shown that the level of the mesopause is related to the dissociation of the oxygen molecule. Some suggestions are made concerning dynamical effects affecting the airglow, formation of ionospheric regions, and dissociation of nitrogen. (Same item as 6.3-91, March 1955, MAB.) *Subject Headings: 1. Oxygen dissociation 2. Nitrogen dissociation 3. Photochemistry of upper atmosphere 4. Upper atmosphere.—From authors' abstract.*

6E-167

551.510.535:551.594.12:551.590.25

Nicolet, Marcel, **Meteor ionization and the nighttime E layer.** Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 72, Nov. 30, 1954. 25 p. 2 tables, 21 refs., 28 eqs. DWB—The nighttime E layer, recombination coefficient in E layer, ionization of meteor atoms, photoionization of meteor atoms, molecular formation, recombination and diffusion are discussed in this report. Data from usual ionospheric recorders were analyzed in order to determine possible ionization effects of meteor atoms. A low value for recombination was used since evidence that a month or more may occur before many meteor atoms which are introduced become involved in specific processes. Hence conclusion is that atmospheric motions are important and "diffusion processes lead to accumulation of meteor atoms near 100 km." *Subject Headings: 1. Recombination processes 2. Meteor ionization 3. E layer ionization 4. Nighttime E layer.—M.R.*

6E-168

551.510.41:546.21

*Nicolet, Marcel, **Photochemistry of oxygen.** Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 61, April 15, 1954. 65 p. 12 figs., 3 tables, bibliog. p. 64-65, eqs. DWB—The aeronomic problem of the dissociation of oxygen was studied quantitatively in the mesosphere and thermosphere. The rate coefficients for various reactions are calculated and concentrations of ozone, molecular and atomic oxygen are deduced. The way in which departures from photochemical conditions may behave and the differences between day and night time conditions are described. (Same item as 6.3-92, March 1955, MAB.) *Subject Headings: 1. Oxygen dissociation 2. Photochemistry of upper atmosphere.—Author's abstract.*

6E-169

551.510.534:551.557

Paetzold, H.-K., **Ozonschicht und Luftbewegungen in der Stratosphäre.** [Ozone layer and air movements in the stratosphere.] *Naturwissenschaften*, 41(14):318-322, July 1954. 3 figs.,

19 refs. **DLC**—Vertical distribution of ozone concentration at Weissenau shows marked variations. Primary maximum is always near 23 km. Secondary maximum near 16 km only occurs when air at 11–16 km comes from north, and is absent in fall and winter, in agreement with annual variation at 20 km in polar regions. A third peak at 6 km is probably also advective. Ratio ozone/air is constant near 20 km showing that vertical movements vanish at that height. Above that is a vertical oscillation with amplitude at least 10 km. Annual variation of ozone at different heights is set out and analyzed into photochemical and advective factors and vertical transport. (*Same item as 5.11 64, Nov. 1954, M.A.B.*) *Subject Headings:* 1. Ozone layer 2. Stratospheric winds. 3. Weissenau, Germany.—*C.E.P.B.*

6E-170

551.510.41:551.507.362

Paneth, F. A. (*Londonerry Lab. for Radiochemistry, South Road, Durham*), **The chemical analysis of atmospheric air.** (In: Boyd, R. L. S.; Seaton, M. J. and Massey, H. S. W. (eds.), *Rocket exploration of the upper atmosphere.* London, Pergamon, 1954. p. 157–158.) **DWB**—Since the great chemical reactivity of O_2 makes its correct sampling forbiddingly difficult, in attempts to determine whether gravitational separation occurs in the stratosphere attention has been directed to the measurement of the A N_2 , Ne N_2 , and He N_2 ratios. *Subject Headings:* 1. Rocket sampling 2. Atmospheric composition.—*Author's abstract.*

6E-171

551.510.535

*Parkinson, R. W., **The nighttime lower ionosphere as reduced from a theoretical and experimental investigation of coupling phenomena at 150 kc/sec.** Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 73, Dec. 15, 1954. 65 p. 28 figs., 34 refs. **DWB**—Results of 10 months of empirical investigation of 150 kc/sec coupling are presented. Sunset D and E region models for July and Nov. 1953 are proposed and a recombination coefficient model (after MITRA) applied to determine variation of these models with time of night. Agreement is found between these data and other low frequency data. Conclusion is that a sharply stratified ionosphere is not necessary for adjustment of theory with observed data. Diurnal and seasonal variations are shown in graphs and tables. *Subject Headings:* 1. Ionospheric coupling 2. Ionospheric variations 3. Recombination coefficient.—*M.R.*

6E-172

551.510.535

Stewart, A. L., **Recombination in the F layers.** *Nature*, London, 173(4395):165, Jan. 23, 1954. 7 refs., 4 eqs. **DWB**—Shows that removal of electrons from F layer cannot be due to metastable nitrogen as suggested by R. B. BANERJI. *Subject Headings:* 1. F layers 2. Recombination processes.—*C.E.P.B.*

6E-173

551.510.5 551.524.7:539

*Vassy, E., **Caractéristiques de l'atmosphère d'après des mesures directes.** [Characteristics of the atmosphere according to direct measurement.] *Journal Scientifique de la Météorologie*, Paris, 6(21):37–39, Jan./March 1954. table. **DWB**—Data on pressure, temperature, density of air and mean free path, for each 2 km from 0 to 110 km, each 5 km to 160 km and each 10 km to 220 km, extracted from HAVENS, KOLL and LA GOW in *J. Geoph. Res.*, 57:59 (1952) and Rocket Panel article in *Physical Rev.*, 88:1027 (1952). Two estimates of temperature are given, one for constant $M=28.966$ (g. mol.) and the other assuming O_2 dissociation above 80 km. The temperature calculated with a constant molecular structure is $11^\circ C$ higher at 90 km, 23° at 100 km, 37° at 110 km, 87° at 130 km, 155° at 150 km, 273° at 180 km and 452° at 220 km than that assuming dissociation and variable M . Results are for lat. $32^\circ N$ and long. $106^\circ W$. *Subject Headings:* 1. Standard atmosphere to 220 km 2. Mean free path of N_2 3. Dissociation effects on stratospheric temperature.—*M.R.*

6E-174

551.510.53:551.557

Weekes, K., **The physical state of the upper atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 80(343):2 15, Jan. 1954. 2 tables, 46 refs. **DWB**—Upper atmosphere is defined as 5% lying above 20 km. Composition is nearly uniform up to at least 60 km and appreciable diffusive separation is unlikely below 100 km. Absorption of UV radiation leads to formation of O_3 in 20–50 km and atomic O in 90–140 km. Dissociation of N_2 and H_2O is discussed. (For fuller abstract see item 5.7–74, July 1954, *M.A.B.*) *Subject Headings:* 1. Upper atmosphere research 2. Stratospheric winds 3. Photochemistry of upper atmosphere.—*C.E.P.B.*

1955

6E-175

551.521.4:537.568

Bates, D. R., **Collisional deactivation and the night airglow.** *Journal of Atmospheric and Terrestrial Physics*, 6(2/3):171 172, March 1955. refs. **MH-BH**—The number of oxygen molecules

dissociated by photoaction near 100 km is of the order of $10^{12}/\text{cm}^2$ column sec. The number of associations must be the same; these associations should lead to the formation of oxygen molecules in excited states, from which a radiation having a photon intensity of 10^{10} to $10^{11}/\text{cm}^2$ column sec. would be expected. The observed intensity, however, is only $1.5 \times 10^8/\text{cm}^2$ column sec. The author reviews existing theories which try to account for this discrepancy and finds them inadequate. He suggests a possible deactivation mechanism, namely the indirect conversion of electronic into kinetic energy through atom-atom interchange. As an example he gives $\text{O}(^3\text{P}) + \text{O}_2(\alpha) \rightarrow \text{O}_2(\beta) + \text{O}(^3\text{P})$.
Subject Headings: 1. Night airglow 2. Recombination processes.—G.T.

6E-176

54(05)(048.8)

†**Chemical Abstracts**, Columbus, Ohio, v. 1, No. 1, Jan. 1907—Latest issue seen 49(7), April 10, 1955. Pub. by the American Chemical Society. Editor, 1955, E. J. Crane. Semimonthly. Author index in each issue; annual author and subject indexes in Dec. issue; cumulative indexes every 10 volumes. Abstracts arranged in 31 subject groups. "List of 5236 periodicals with key to 283 library files issued as Pt. 2, Dec. 25, 1951." **DLC**—Contains more references to meteorological literature than any other general abstracting periodical except *Physics Abstracts*. For literature applicable to this bibliography, one must consult the subject index under such subjects as: Atmosphere, Ionosphere, Oxygen, Ozone, Nitrogen, Light (ultraviolet), Dissociation and Recombination. (Same item as 6A-19, Jan. 1955, *MAB*.) **Subject Headings:** 1. Chemical abstracts 2. Abstracting periodicals 3. Photochemistry of the upper atmosphere. I. American Chemical Society.—M.R.

6E-177

551.510.535

Krasovskii, V. I., O kontsentratsii gidroksila v verkhnei atmosfere. [Hydroxyl concentration in the upper atmosphere.] *Akademiia Nauk SSSR, Doklady*, 99(6):979-981, Dec. 21, 1955. 14 refs., 9 eqs. **DLC**—The author reviews his own explanation and that of BATES and NICOLET of the rotating-oscillatory field of the hydroxyl radical in the illumination of the upper atmosphere. Theoretical arguments are presented in support of the hypothesis that oscillating-disturbed hydroxyl is due to reaction of hydrogen atoms with newly formed oscillating-disturbed oxygen molecules which appear during the process of recombination by equilibrium dissociation. **Subject Headings:** 1. Hydroxyl in upper atmosphere 2. Recombination processes.—I.L.D.

6E-178

551.594.51:546.17

Omholt, A., Intensity measurements of the second positive band system of nitrogen in high-latitude aurorae. *Journal of Atmospheric and Terrestrial Physics*, 6(1):61-63, Jan. 1955. 3 tables, 7 refs. **DWB**—Two good spectra obtained at Tromsø with a 2-prism spectrograph at zenith distance 60° are tabulated and compared with those of a nitrogen lamp. Relative values can hardly be explained by supposing that only electrons take part in the excitation process. **Subject Headings:** 1. Auroral spectra 2. Nitrogen spectra.—C.E.P.B.

6E-179

55 551.510.535:541.14(05)

†**Physics Abstracts (Section of Science Abstracts)**. Edited and issued by the Institution of Electrical Engineers in association with The Physical Society, The American Physical Society and the American Institute of Electrical Engineers. London. v. 1, 1898—Latest issue received v. 58, No. 687, March 1955. Title varies. **DLC**—Physics Abstracts presents a world-wide coverage of literature on all phases of physical science. The abstracts are arranged according to the Universal Decimal System. The section on Geophysics (55) contains numerous references to the upper atmosphere classified under 551.510. . . . The section on physical chemistry (541) contains some material applicable to the subject of this bibliography. References to material on the photochemistry of the upper atmosphere may also be located by consulting the annual subject index under such headings as: Atmosphere; Ionization atmosphere; Ionosphere, and Ions. (Same item as 5C-264, March 1954, *MAB*.) **Subject Headings:** 1. Physical sciences 2. Photochemistry of the upper atmosphere 3. Abstracting periodicals.—M.L.R.

6E-180

551.510.535:016

Rice, Mary L., A selective bibliography on ionospheric propagation. *Meteorological Abstracts and Bibliography*, Boston, 6(4)489-547, April 1955. 293 refs. **MH-BH, DLC, DWB**—An annotated bibliography containing 293 references with emphasis on papers dealing with theories of origin, physics and chemistry, structure and variations of the ionosphere and instruments and investigation of this region of the earth's atmosphere. Imprints cover the period from 1902 to 1955, with the bulk of the material published since 1950. A detailed subject outline is provided. Items 6D-44, -83, -128, -169, and -201 deal with ionospheric propagation. **Subject Headings:** 1. Ionosphere bibliographies 2. Photochemistry of upper atmosphere.—M.L.R.

SUPPLEMENTARY MATERIAL

6E-181

551.594.12:551.510.535

Hulburt, E. O., **Ionization in the upper atmosphere of the earth.** *Physical Review*, 31 (6):1018-1037, June 1928. 3 figs., 2 tables, 46 refs., 26 eqs. **DLC**—Develops a theory of the ionization of the upper atmosphere of the earth by ultraviolet light of the sun, based on known laws of pressures and constitution of the upper atmosphere, ionic recombination, attachment of free electrons to neutral molecules and diffusion of ions. Discusses seasonal and diurnal changes in ionization, pointing out that they are in agreement with the corresponding variations in radio wave propagation phenomena. *Subject Headings: 1. Ionization theory 2. Recombination processes.*—*From author's abstract.*

6E-182

551.510.41:551.510.53

Paneth, F. A., **Chemical exploration of the stratosphere.** *Nature*, London, 139 (3509-3510):180-182, 220-223, Jan. 30-Feb. 6, 1937. 3 figs., 3 tables, 6 refs. **DLC**—Description and illustration of a balloon-borne stratospheric air sampling apparatus. A table of stratosphere flights made with manned and unmanned balloons is presented. Helium and oxygen content of air at various altitudes up to 29 km is tabulated, showing increase of helium and decrease of oxygen concentration as a function of altitude. (*Same item as 3B-182, Feb. 1952, MAB.*) *Subject Headings: 1. Atmospheric composition 2. Stratospheric air sampling.*—*G.T.*

6E-183

551.510.535:551.594.12

Hulburt, E. O., **Photoelectric ionization in the ionosphere.** *Physical Review*, 53 (5):344-351, March 1, 1938. 6 figs., refs., 17 eqs. **DLC**—The ionization equilibrium in the various atmospheric gases is calculated from the Saha theory on the assumption that the spectral energy curve of sunlight for ultraviolet frequencies above the limits of the principal series is that of a black body at 6000°K. A calculated region of ionization due mainly to oxygen and partly to nitrogen is found at about 200 km with maximum electron density 1.6×10^{12} , in agreement with F2 observation in winter temperate latitudes. Calculation suggests that E ionization is mainly ionic resulting from two processes, the first being the formation by the ionizing radiation of positive ions and free electrons, and the second being the formation of negative ions by the attachment of the electrons to oxygen molecules. *Subject Headings: 1. Ionospheric ionization 2. E layer ionization 3. F layer ionization 4. Electron attachment.*—*Author's abstract.*

6E-184

551.510.535:537.568

Massey, H. S. W., **Recombination and attachment processes in the ionosphere.** *International Union of Geodesy and Geophysics. Association of Terrestrial Magnetism and Electricity, Bulletin*, No. 11:521-523, 1940. refs., eqs. **DLC**—From a theoretical analysis of electronic attachment and detachment reactions in the ionosphere it appears that the large recombination rate observed in the E layer cannot be accounted for by recombination of positive ions with electrons, but must be partly due to recombination of positive with negative ions, this latter arising from electron transfer collisions such as $O^- + O^+ \rightarrow O' + O''$. For this type of reaction to occur with sufficient frequency it is necessary to assume a negative-ion/electron density ratio of 100 in the E layer (and of unity or less in the F layer). *Subject Headings: 1. Recombination processes 2. Ionization processes.*—*G.T.*

6E-185

551.510.535:551.594.51:535.33

Vegard, L., **Continued investigations on the auroral luminescence and the upper atmosphere.** *Geofysiske Publikasjoner*, Oslo, 12 (14), 1940. 23+p. 4 figs., 11 tables, 34 refs., 24 eqs. **DLC**—Results of spectroscopic auroral observations made at Tromsø in 1938 are tabulated and discussed. The chapter on the interpretation of observed latitude and altitude effects (p. 8-10) includes consideration of dissociation, recombination and ionization processes in the upper atmosphere under the influence of solar radiation of the soft X-ray type. *Subject Headings: 1. Auroral spectroscopy 2. Atmospheric composition 3. Tromsø, Norway.*—*G.T.*

6E-186

551.510.3:535.33

Vegard, L., **Spectroscopy of the higher atmosphere.** *Physica*, The Hague, 12 (9/10):606-614, Dec. 1946. refs. **DLC**—A list is given of the emission lines and bands that have been observed in the night sky spectrum with the spectrographs at the different auroral observing stations in northern Norway. In addition to the forbidden lines of O I and O III there are many other lines due to O II indicating that a considerable fraction of the O in the auroral region of the atmosphere exists in the form of singly ionized atoms. The appearance of strong bands of N and the absence of O bands indicates that dissociation is much greater for O than for N, thus accounting for the weakness of the lines of atomic N. Occasionally lines of the Balmer series of H are observed; and fluctuations are noted in the intensity of the D lines of Na in high auroral streamers after the sun's ultraviolet

light is screened off by the earth's shadow. These facts indicate that at times showers of H and Na, of cosmic origin, fall into the auroral region. *Subject Headings:* 1. Auroral spectra 2. Oxygen dissociation 3. Nitrogen dissociation 4. Atmospheric composition 5. Norway.—*Chemical Abstracts*, No. 5017/a 1947.

6E-187

551.510.535:537.568

Bates, D. R., *The emission of the negative system of nitrogen from the upper atmosphere and the significance of the twilight flash in the theory of the ionosphere.* *Royal Society of London, Proceedings, Ser. A*, 196 (1047):562-591, April 22, 1949. figs., 8 + tables, numerous refs., 31 + eqs. **DLC**—The cause of the emission of the negative band system of nitrogen from the upper atmosphere during twilight is investigated. A study is made of the two possible excitation mechanisms, $N_2(X^1\Sigma_g^+) + h\nu \rightarrow N_2^+(B^2\Sigma_u^+) + e$ and $N_2^+(X^2\Sigma_g^+) + h\nu \rightarrow N_2^+(B^2\Sigma_u^+)$. It is shown that the latter is far more effective than the former. It appears that N_2^+ ions form but a minute fraction of the total ion content. It is pointed out that the remarkable rarity of N_2^+ ions proves conclusively that recombination between the charged particles present in the ionosphere cannot be the origin of the nocturnal radiation of the nitrogen band systems. On some occasions the resonance emission at twilight is of unusually high intensity. It is presumed that this is due to incident charged particles increasing the concentration of N_2^+ ions. *Subject Headings:* 1. Twilight flash 2. N_2 excitation 3. Night airglow.—*From author's abstract.*

6E-188

551.510.41:551.510.53

Crackett, K. F.; Paneth, F. A. and Wilson, E. J., *Chemical composition of the stratosphere at 70 km height.* *Nature*, London, 164(4160):128-129, July 23, 1949. 7 refs. **DLC**—Methods of sampling (using V₂ rockets) and analysis are described. Results of argon, helium and neon determinations are shown in a table. Concludes that chemical composition of stratosphere air at 70 km is practically the same as that of the troposphere. *Subject Headings:* 1. Atmospheric composition 2. Stratospheric air sampling.—*M.L.R.*

6E-189

551.510.534:541.14

Chapman, S. (Oxford), *The photo-chemical theory of atmospheric ozone.* *I.U.G.G. Association of Meteorology, Brussels, 1951, Proces-Verbaux des seances. Mémoires et discussion*, pub. Brussels, 1953. p. 305-306. 5 refs. **DWB**—A general discussion of the possibility of explaining ozone distribution by the photodissociation of oxygen. No adequate information is available about the constants involved so that the effect of atmospheric movements cannot be properly separated. *Subject Headings:* 1. Ozone theory 2. Photochemical theory of ozone 3. Oxygen dissociation.—*A.A.*

6E-190

551.510.534:541.14

Dütsch, H. U. (Zürich), *The photochemical theory of the atmospheric ozone as a means of investigating turbulence and circulation in the lower strato-sphere.* *I.U.G.G. Association of Meteorology, Brussels, 1951, Proces-Verbaux des seances. Mémoires et discussion*, pub. Brussels, 1953. p. 322-332. 2 figs., 2 tables, 3 eqs. **DWB**—The vertical distribution of ozone under equilibrium is computed for different latitudes and seasons, as well as the seasonal variation of a non-equilibrium distribution for an atmosphere at rest. Discrepancies between these results and the actual distribution are explained by vertical turbulence and large scale exchange. *Subject Headings:* 1. Ozone distribution 2. Photochemical theory of ozone 3. Stratospheric circulation.—*From author's abstract.*

6E-191

551.510.53:535.215

Ditchburn, R. W. (Physics Dept., Reading Univ.), *Ultra-violet radiation absorption cross-sections.* (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), *Rocket exploration of the upper atmosphere.* London, Pergamon, 1954. p. 313-326. 7 figs., 2 tables, refs. p. 325-326, 3 eqs.) **DWB**—The significance of radiation absorption cross-sections in relation to theories of ionization balance in the atmosphere is discussed; then the cross-section for atoms with one valence electron, and atoms with two valence electrons, assuming photoionization is the only effective process. The effect of autoionization; results with rare gases; molecular band and predissociation spectrum of O₂, N₂, O₃, oxides of nitrogen, CH₄, H₂, NH₃, CO₂, H₂OCO, etc. are given in table and discussed separately. Finally effects in F₂, F, E and D layer ionization are discussed. *Subject Headings:* 1. Photoionization 2. Ultraviolet spectral cross sections 3. Photochemistry.—*M.R.*

6E-192

551.510.534:551.507.362

*Johnson, F. S.; Purcell, J. D. and Tousey, R. (U. S. Naval Res. Lab., Wash. 25, D. C.), *Studies of the ozone layer above New Mexico.* (In: Boyd, R. L. F., Seaton, M. J. and Massey, H. S. W. (eds.), *Rocket exploration of the upper atmosphere.* London, Pergamon, 1954. p. 189-199.

Vassy, E., *Remarks, Ibid.*, p. 200-201. 8+1 figs., table, 13+6 refs.) DWB—This paper summarizes and discusses the data on the vertical distribution of ozone obtained by solar spectroscopic methods from rockets flown in New Mexico. The results extending in one case to 70 km, are in good agreement with photochemical theory. Data on total ozone, and, on one occasion, Umkehr effect measurements of its vertical distribution, are compared with the direct observations. Results of a calculation of the diurnal temperature variation in the ozone layer, using the rocket data, are included. The rocket data, which are all based on spectrometric observations of ozone absorption of the solar radiation, have been obtained in three ways: photographic, photoelectric, and by photon counters. VASSY calls attention to possible discrepancies due to lack of validity of absorption coefficients (NY and CHOONG) in Hartley band or to possible pressure and temperature effects in HARTLEY or HUGGINS. *Subject Headings:* 1. Ozone distribution 2. Rocket soundings 3. Ozone temperatures.—*Authors' abstract, M.R.*

6E-193

551.510.53:551.507.362

†Leak, William M., *Rocket research at NRL. U. S. Naval Research Laboratory, NRL Report*, No. 4441, Nov. 12, 1954. 26 p. 20 figs., table, 41 refs. DWB—The Navy Research Laboratory began working on upper air research on Dec. 17, 1945 in the new Rocket Sonde Research Section. The work has been expanded so that two branches now exist: 1) Rocket sonde and 2) Rocket Development in Atmosphere and Astrophysics Div. Optics Div. also conducts upper atmosphere and solar radiation work. About 60 scientists are now engaged in this work. Over 175 experiments have been performed with V-2, Viking, Aerobee and Deacon rocket borne instruments. This instrumentation is described and most important results in research on ultraviolet spectra, ionosphere, geomagnetism, upper air composition, density, pressure, temperature, cosmic rays, etc., are indicated. Data on O₃ composition was obtained up to 70 km on June 14, 1949, showing maximum concentration with respect to air at 28 km (the same as in Oct. 10, 1946) though actual maximum O₃ was at 26 km (0.11 mm/km) and at 24 km (0.17 mm/km). These data and other data from 20 to 70 km agree with photochemical theories of WULF and DEMING (1936 and 1937), DÜTSCH (1946), CRAIG (1950) and BATES and NICOLET (1950) as calculated according to Chapman's method (1930). The composition of the atmosphere from 96 to 137 km was investigated with a Bennett radio-frequency mass spectrometer in an Aerobee on Feb. 12, 1953. Results of 172 traverses and analysis of samples show that ratio of argon to N₂ does not change as a function of altitude up to 137 km as would be predicted from diffusive separation theory. Some errors are suspected in these samples, however. *Subject Headings:* 1. Rocket research 2. U. S. Naval Research Laboratory 3. Upper atmospheric composition 4. Photochemical theory of ozone.—*M.R.*

6E-194

551.510.53:551.507.362

Martin, G. R. (*Londonderry Lab. for Radiochemistry, Univ. of Durham*), *The composition of the atmosphere above 60 km.* (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), *Rocket exploration of the upper atmosphere*. London, Pergamon, 1954. p. 161-168. 4 figs., table, 6 refs., 5 eqs.) DWB—The available data on the composition of the upper atmosphere are shown to be more nearly consistent with the assumption that the observed separations are the result of mass discrimination by the sampling system than with an assumed "gravitational" equilibrium in a quiescent atmosphere. The balance of evidence at present does not suggest that there is any substantial variation in atmospheric composition at least to heights of the order of 90 km. *Subject Headings:* 1. Rocket research 2. Upper atmosphere composition.—*Author's abstract.*

6E-195

551.510.53:551.507.362

Reasbeck, P. and Wiborg, B. S. (*Londonderry Lab. for Radiochemistry, Univ. of Durham*), *Chemical analysis of upper atmosphere air samples from 50 km to 93 km height.* (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), *Rocket exploration of the upper atmosphere*. London, Pergamon, 1954. p. 158-161. 2 tables, 3 refs.) DWB—By means of V-2 and Aerobee rockets, samples of air from heights ranging from 50-93 km have been obtained in the U.S.A., and have been sent to Durham for chemical analysis. These have been measured for oxygen, nitrogen, helium, neon, and argon amounts. With all the samples taken from above about 58 km height, an increasing enrichment of the air in helium and neon with height has been found, and a continued depletion of argon. A large deficit of oxygen was found in many samples, but this is attributable to the method of sampling. *Subject Headings:* 1. Chemical composition of upper atmosphere 2. Rocket soundings.—*Authors' abstract.*

6E-196

551.510.534

Regener, E.; Paetzold, H. K. and Ehmert, A., *Further investigations on the ozone layer.* (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), *Rocket exploration of the upper atmosphere*. London, Pergamon, 1954. p. 202-207. 8 figs., 8 refs.) DWB—Ozone concentrations have been determined by the following methods: 1) balloon ascents with a UV spectrograph to 35 km,

2) lunar eclipse method and 3) chemical methods (on the ground and in aircraft). The paper presents the results of many such ascents or observations, showing wide variation in height and concentration of O_3 maximum, different times and places, though average of all these distributions is in agreement with photochemical theory for region above 24 km and latitudes $0-70^\circ N$. Results indicate that a) O_3 increases sharply between 10 and 21 km in Polar regions at the end of the polar night, b) layer above 20 km is nearly constant (.18-.20 cm O_3), c) above 30 km a maximum occurs in early summer due to photochemical processes, and at 20-25 km a minimum due to increased turbulence, and d) <20 km vertical currents give a maximum compression in Nov. and a maximum expansion in May. *Subject Headings: 1. Ozone variations 2. Photochemical theory of ozone.—M.R.*

6E-197

551.510.53:535.243

Townsend, John W., Jr.; Meadows, Edith B. and Pressly, Eleanor C. (*Naval Res. Lab., Wash., D. C.*), **A mass spectrometric study of the upper atmosphere.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), **Rocket exploration of the upper atmosphere.** London, Pergamon, 1954. p. 169-188. 14 figs., table, 9 refs.) DWB—The composition of the upper atmosphere between 95.8 km and 137.3 km above sea level has been studied by means of a radio-frequency mass spectrometer. The spectrometer, installed in an Aerobee rocket launched at White Sands Proving Ground, New Mexico, at 0009 hours (M.S.T.) on February 12, 1953, measured the relative abundance of all gases between mass numbers 54 and 6 on the ascent and descent of the rocket. 172 individual traverses of this mass range were made at a rate of 0.94 per second. The data show that the ratio of argon to molecular nitrogen failed to change as a function of altitude in a manner consistent with the existence of diffusive separation. However, it must be pointed out that strong evidence exists that the gas analyzed by the spectrometer was in some part contaminated by gases originating from the rocket. *Subject Headings: 1. Upper atmosphere composition 2. Spectrophotometric observations.—Authors' abstract.*

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Note: The contents of periodicals included in this section are for information only and will not be listed in the monthly indexes until abstracted. When material is furnished in advance of date of publication, the pagination may be omitted.

Advances in Geophysics, volume 2, edited by H. E. Landsberg. Editorial advisory Committee, Bernhard Haurwitz; Walter D. Lambert; James B. Macelwane and Roger Revelle. New York, Academic Press, 1955.

- Marshall, J. S.; Hitschfeld, Walter and Gunn, K. L. S.: *Advances in radar weather*, p. 1-56.
Gringorten, Irving I.: *Methods of objective weather forecasting*, p. 57-92.
Pierson, Willard J., Jr.: *Wind generated gravity waves*, p. 93-178.
Kulp, J. Laurence: *Geological chronometry by radioactive methods*, p. 179-217.
Benioff, Hugo: *Earthquake seismographs and associated instruments*, p. 219-275.

American Geophysical Union, Transactions, Volume 36, Number 2, April 1955.

- Woodruff, N. P. and Zingg, A. W.: *A comparative analysis of wind-tunnel and atmospheric air-flow patterns about single and successive barriers*, p. 203-208.
Bryson, Reid A.: *Convective heat transfer with light winds*, p. 209-212.
Stoll, Alice M. and Hardy, James D.: *Thermal radiation measurements in summer and winter Alaskan climates*, p. 213-226.
Alpert, Leo: *Silver iodide cloud seeding in Puerto Rico*, p. 227-234.
Dinger, J. E. and Fisher, G. H.: *Microseism and ocean wave studies on Guam*, p. 262-272.
Schooley, Allen H.: *Curvature distributions of wind-created water waves*, p. 273-278.
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